

British Society for the
Study of Orthodontics.
1921.

TRANSACTIONS

OF THE

British Society for the Study of Orthodontics.


1921

London :

PUBLISHED FOR THE SOCIETY BY
THE DENTAL MANUFACTURING COMPANY, LIMITED,
ALSTON HOUSE, NEWMAN STREET, W.1

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British Society for the Study of Orthodontics.

AN Ordinary Meeting of the British Society for the Study of Orthodontics was held at 11, Chandos Street, Cavendish Square, W., on Monday, January 17th, 1921, at 8 p.m., Mr. J. LEWIN PAYNE, President, in the chair.

The minutes of the previous meeting were read and confirmed.

ADMISSION OF A MEMBER.

Mr. F. N. Doubleday was admitted a member of the Society, and introduced by the President to the meeting.

ELECTION OF MEMBER.

Mr. B. MAXWELL STEPHENS proposed, Mr. HAROLD CHAPMAN seconded and Messrs. H. C. HIGHTON and SIDNEY SPOKES supported, the nomination of Mr. Jack Kenneth Grayson, of Mount Pleasant, Turner's Hill, Cheshunt, Herts, as a member of the Society. A ballot was taken and later in the meeting the PRESIDENT announced that Mr. Grayson has been duly elected.

Mr. Pritchard and Mr. Parker were present as guests.

CASUAL COMMUNICATION.

ANCHORAGE WITHOUT BANDS.

BY HAROLD CHAPMAN, L.D.S., D.D.S.

THE idea is very simple ; when temporary molars are to be banded for the purpose of attaching an arch to them, these bands should give way to gold inlays. I have adopted the method in two cases, the arches used being lower lingual ones in both cases ; these were chosen for the reason that they appeared to me the simplest, but I see no reason why it should not be used for buccal or lingual arches, in either upper or lower jaw, and I am not at all sure that an attachment such as this would not be preferable to anchor bands, plain or clamp, in the case of permanent teeth. In my opinion there is no anchor band fitted which does not injure the soft tissues about the neck of the teeth to a greater or lesser degree ; I do not say the injury is apparent at once or within a given time, but I have little doubt that the tissues about the necks of such teeth will not be in as good condition ten or fifteen years hence as they would be had they not been banded. I would like to suggest this to members as a subject on which one might base a communication to the Society in the near future. So I look forward to a time when anchor bands will be discarded just as bands on anterior teeth for rotation, etc., are no longer essential, as Mr. Friel has shown us. Were it necessary for me to have one of my own molars either banded or filled with a gold inlay, I would unhesitatingly choose the latter. I base my choice on my experience as a dentist and not as an orthodontist.

The idea is so simple that there is really nothing more to be said about it, except to have a sufficiently large surface of inlay where the anchor attachment is to be. In the case of a lingual attachment I make an occluso-lingual gold inlay dovetailed

so that it can only be removed either lingually or occlusally, the direction chosen being that in which there is no strain, e.g., for a vertical tube I make the inlay removable lingually, and for a horizontal tube, I would make the inlay removable occlusally, but I do not think this point of great moment. I will hand round examples of these two attachments.

It may be of interest to you if I add that I do not find this method more difficult than the anchor band method. A cavity can be prepared and an impression taken comfortably in one visit. At the next visit the same can be done on the other side. At the next the inlays are put in place and an impression taken; the inlays are left in it. Before the next visit the appliance is made, and when the patient returns the whole thing is put in the mouth, including the cementing of the inlays; thus four short visits are ample. If one had to separate the teeth to fit and cement bands, I think the inlay method may occupy less time, and it certainly is not less efficient. If it is required to use intermaxillary traction, the hook for the elastic may be cemented directly into the tooth, as in the case of a Morris spur.

I hope, you will think over whether this is not a sound practical suggestion. I put the method into practice in two cases last July; in one case the vertical lingual tube came off a few days later; probably it was soldered too near the occlusal surface and bitten off. It was resoldered, and in neither case has any further trouble arisen.

The PRESIDENT said that Mr. Chapman was continually bringing to the notice of the members ingenious methods which would help them in their work. He thought that after seeing the models everyone would agree that the method which had just been described would be exceedingly useful in certain cases where anchorage was needed.

Mr. J. H. BADCOCK said Mr. Chapman had been kind enough to send him an advance description of his ingenious device, which he had read with very great interest. He was inclined to doubt, however, whether he would be able to cut the cavity and adapt the inlay as quickly and easily as Mr. Chapman seemed able to do. The idea was excellent and the device exceedingly neat. He thought that perhaps Mr. Chapman laid too much stress on the injury which might be done by a band. If any injury was so caused it would probably only be slight, and would right itself very quickly, especially in the case of young people. He doubted whether such an injury would last for more than a very short time, and thought ten days was more probable than the ten years mentioned by Mr. Chapman, although he did not profess to speak on that matter with any certain knowledge. He would like to ask whether the cutting of the cavity for the inlay was not a more difficult operation for the child to undergo.

Mr. A. T. PITTS understood that the inlay was cemented into position so that it became a permanent filling. If at a later date the tube broke off, he imagined it would be rather a difficult business to remove the inlay to solder on the tube again. Although he detested the idea of a band, he disliked equally the prospect of having a sound tooth cut into to make an inlay. Many upper molars had a well-marked incisor cusp internal to the main one, and that might present a difficulty in cutting out and filling in a good inlay. With children's teeth there might not be room to cut out a proper cavity for an inlay.

Mr. HAROLD CHAPMAN, replying to the discussion, said that what he had in mind when speaking of a term of ten or fifteen years, to which Mr. Badcock had alluded, was that if lesions were likely to take place in an individual after that length of time, it would be accentuated if there had been a band on the tooth for orthodontic purposes. With regard to the point that his method might be more difficult to fit than

a band, in the two cases to which he had referred he had not found it any more difficult, and he did not think it had been more difficult for the patients. A week or two ago, however, he had been unable to complete the preparation of the cavity in a single sitting, but in that case he had had to deal with a sensitive, nervous child. Mr. Pitts would have gathered that in one case he had removed the inlay in order to re-solder on the tube. By using a burr between the edge of the inlay and the edge of the tooth it came out quite easily, as one knew the direction in which it was removable.

The PRESIDENT then delivered his Inaugural Address.

ORTHODONTICS.

CUSTOM has ordained that your President shall deliver what is termed an inaugural address at this the first meeting of the new session, and, in rising now, my first and most pleasing duty is to thank you for your kindness in inviting me to preside over the meetings of this Society during 1921.

To have one's name associated with those of the ten eminent orthodontists who have preceded me in this office is an honour which I greatly appreciate, and yet, Gentlemen, believe me, I would have sought relief from this responsibility, for, as I have already protested, I am inadequate to fill this chair. The knowledge, experience and dignity which have been the common possession of my predecessors are not qualities which I can assume. I cannot claim to have special knowledge in Orthodontics, and, when I joined this Society at its foundation, it was with the consciousness that I was very ignorant of the causes, pathology, and treatment of irregularities of the teeth.

However, it is generally understood that we are essentially a Society of learners. Orthodontics is a science comparatively young, and a great deal concerning the subject is still very obscure. Perhaps this may be a reason why you should have selected to be your President for the present year a member who has so much to learn.

As most of you are aware, this Society was founded in December, 1907, under the presidency of my former preceptor and later honoured colleague, Mr. J. H. Badcock, to whom I, amongst others, owe a debt which can never be paid, and whose knowledge, skill, and enthusiasm have done so much for the science of Orthodontics in this country. At the outset our title was "The British Society for the Study of Orthodontia," but in December, 1909, this was changed to that of "The British Society for the Study of Orthodontics," and it was Sir James Murray, the eminent philologist of Oxford, who proposed the term "Orthodontics," as being wider in its scope and one which would include principles and practice as well as prevention and treatment of malocclusion of teeth.

We began in a very modest way with a membership of 42, but in spite of the prophecy of pessimists, and in spite also of opposition from some quarters, the Society reached a total of 67 by the end of its first year. There is now a membership of 102.

We met in those days, as Mr. Badcock explained, as a body of students feeling the vital need of intercourse and discussion, of mutual help and encouragement. We realised quite well that we were dealing with a branch of dental surgery which, up to that time, had not received its full share of attention on the part of the profession in this country. Considerable divergence of opinion may be expected in connection with any subject which is not yet fully

understood, and such division of opinion on this subject is no new thing. Even a century ago there were at least two schools of thought in the treatment of irregularities of the teeth ; for, on reading the works of Joseph Fox and Thomas Bell, one finds that Fox favoured the extensive extraction of teeth in the treatment of his cases, whereas Bell favoured a much less drastic use of the forceps.

In complaining of Fox's methods Bell says : " I have known no less than eight, and even ten, firm teeth forcibly removed from the jaws of a child at once. I will not employ the terms of indignation and disgust which such barbarous quackery deserves." They seem to have been quite as keen in expressing disapproval of opposing views as some of us are to-day.

This Society, I am glad to say, is not composed of men of only one idea : we have representatives of all schools of thought. We have had those who believe that most orthodontic treatment can be accomplished by means of extraction alone, and we have had those who would never extract a tooth merely for the purpose of correcting a deformity, and we have others who are prepared to employ each method when it appears to be specially called for in a particular case.

It is well that all shades of opinion should be expressed, for by discussing these divergences of opinion we stand a better chance of weeding out error and of establishing the truth on a scientific basis.

This Society is now commencing the fourteenth year of its existence, though during the years of the great war the meetings were few and far between.

In any case, it may be considered to have passed through the first stages of early youth, though the malady of war hampered its growth for several years.

Now with the return of health and activity I should like to see three things accomplished by the Society in the near future.

First of all, I think the time has come for strengthening its organisation by an addition to its membership. There must be many dental surgeons keenly interested in the subjects discussed here who remain outside, and I would suggest that each of us should make an effort to bring some of these men into the Society during this year.

Then, one of the primary aims of this Society was the formation of a museum where specimens, models, photographs, radiographs and apparatus, carefully classified and clearly displayed with notes relating to each case, might provide the means for careful study and research for any of our members who desire to do this work.

Progress has already been made in gathering material together and we are particularly indebted to our able and enthusiastic curator, Mr. Maxwell Stephens, for his interest in this direction.

The opportunities, however, of inspecting this museum are few, and the specimens are packed away in a cupboard, where they cannot be easily investigated. In my opinion the time has come for housing this museum under conditions whereby it may be easily accessible to all members of this Society not only at the time when we meet together but at other times also, when personal private study of the specimens might be made.

Within the museum accommodation should be found for the library of the Society, so that members might come there to read orthodontic literature at stated times.

The old Odontological Society of Great Britain owed much of its strength and influence to an excellent library and an unparalleled dental museum.

For my part, I would urge this Society to give serious thought to the establishment of an orthodontic museum which may be at least the equal of any of its kind in existence.

The third matter to which I wish to call special attention is that of Education. During the last two or three years considerable thought has been given in many quarters to the subject of Dental Education, and in the course of the present Session we hope that this Society may be able to place before the profession some definite proposals with regard to the teaching of Orthodontics to students in our dental schools.

It has been suggested that I should say something about this in my address to you. Presently, however, we are to have the pleasure of listening to a paper by Mr. McKeag of Belfast on "Orthodontic Education," and at our February meeting Mr. Cale-Matthews will bring before us "Some Thoughts on Orthodontic Teaching with Practical Results." I would suggest that the teaching of orthodontics should be considered under two categories: (1) that for the dental surgeon who wishes to specialise in orthodontics; (2) that for the general practitioner of dentistry. In the training of the specialist, and I think we shall be agreed upon this point, all that is known about orthodontics should be included in his curriculum, and for attaining this end the establishment of a post-graduate school of orthodontics, either as an independent organisation or, better still, in association with one of our present schools, would be of great value.

In October, 1918, Mr. Bertram Samuel made the suggestion to the members of this Society that a London orthodontic centre should be formed where undergraduates and post-graduates might receive special instruction whilst the treatment of cases was proceeding.

The general consensus of opinion expressed at that meeting was, that a course of study under such conditions could only be adapted for post-graduates, seeing that undergraduates have their time already fully occupied at their own hospitals where they are (or should be) taught the rudiments of orthodontics; it was said also that this Society was fulfilling the want of a post-graduate centre, and that the time for further extension in the work of this speciality was not yet ripe.

Since then, no steps have been taken in fulfilment of Mr. Samuel's suggestion, but I think the matter is worthy of further consideration.

In making provision for the general practitioner of dentistry, all students should have some training in orthodontics.

Just as the medical student who is to become a general practitioner is required to have some knowledge of all branches of his science, so, too, for the student who is to practice general dentistry, orthodontic principles and *elementary* technique should find their way into the ordinary dental curriculum.

The general medical practitioner will not be expected to possess the skill to perform the more difficult surgical operations; neither should the ordinary dental surgeon be expected to undertake anything more than the simple cases of malocclusion, but he should be able to recognise the character of the cases brought to him.

It is when we come to consider the knowledge which is essential for him in taking the diploma entitling him to practice that difficulty arises.

Obviously it is impossible to teach all about orthodontics in the limited time available for a qualifying diploma, yet, even if he is never to treat any case on orthodontic lines, it is essential for every dental surgeon to know something concerning malocclusion of the teeth, for it is a matter which has its bearing upon all branches of practice, and it is obvious that he must have a sufficiently clear grasp of the subject to be able to co-operate intelligently with the specialist in orthodontics.

Chief attention must be given to the fundamental principles upon which the recognition and correction of malocclusion has been based. Above all things, normal processes, etiology and pathology of abnormalities must be studied and the earliest deviation from normality should be recognised.

Dr. E. A. Bogue, our distinguished honorary member, did a great service to the community when he published a series of articles on "Orthodontia of the Deciduous Teeth," in which the importance of the very earliest care of children's teeth for orthodontic diagnosis and treatment was emphasised.

He has shown us how necessary it is to deal with the early symptoms which occur between the ages of four and seven. He claims that the correction of irregularities of the temporary teeth of young children is the most important work of modern dentistry.

We recognise now that when a child has reached the age of five, if the temporary incisors stand close together, each tooth touching its neighbour on both sides, and if they continue thus to the age of six or later, it is a form of irregularity.

The alteration of the relationship of the mandible to the maxilla when the deciduous incisors assume an edge-to-edge occlusion is also an observation of importance.

In planning the course for the general dental practitioner we must be careful to see that a curriculum already heavily burdened is not overloaded with fresh special studies. Orthodontics should not be taught as an isolated entity, but, as Sir George Newman has suggested with regard to many medical subjects, rather as an integral part of a complete scheme. There should be a short special clinical course with lectures given by an orthodontic specialist during the fourth year of study, but a considerable portion of fundamental principles might well be learned with the preliminary subjects. The greatest need of the country in dental matters to-day is the training of students for preventive dentistry, and I would urge this theme upon my hearers. We need a higher ideal than that of being able to perform operations perfectly; what we must aim at is to avert the conditions which call for these operations.

The general dental practitioner should be able to explain clearly to all parents and children certain cardinal principles in regard to prophylaxis, and for this purpose he must commence his studies with normal structures and processes.

There is always a temptation to take short cuts, but if the student is to progress on sound and scientific lines he must give careful consideration to the preliminary subjects.

These are a few points that I hope may be deemed worthy of consideration.

In conclusion, let me repeat what has been urged so often—

may this Society never forget that its ideal is the discovery of the means whereby irregularities of the teeth may be prevented ; and I believe that careful consideration of methods of teaching, and the establishment in suitable quarters of a museum and library, where study and research may be carried on, will help us towards this ideal.

Mr. M. F. HOPSON said it was his privilege and pleasure to move a vote of thanks to the President for the address he had just given. He was sure all those present would go away stimulated by what they had heard—stimulated to attend the meetings more regularly than some of them had done in the past, and to do their best to make the Society the success it deserved and ought to be. The President had reminded them that the Society had now been in existence for fourteen years, and had put before them certain things to which particular attention should be paid during the present session. The first point was that the membership of the Society should be enlarged. That was a matter which concerned them all. In the second place he had emphasised the necessity of getting on with the completion and location of the museum. Personally, he believed that opportunities were now available for securing a place in which the museum could be housed, and where it would be more accessible for study than had been the case in the past. He agreed that it would be of great use to a very large number of the members if the museum were made more complete and readily available. Finally, the President had dealt with education, a subject to which the Society might very well direct its attention. A paper on education was to be read that evening, and he understood another, bearing on the same subject, would be delivered at the next meeting. It might very well be that before the President's term of office was up they would be able to make a definite pronouncement on the way in which orthodontics should be taught to students, and perhaps formulate a scheme by which those in general practice might increase their knowledge of so important a subject. The President had thrown out many stimulating ideas which could be put into operation, and he was sure all the members would think them over and feel it their duty, both individually and collectively, to help him to achieve the aims he had in view. He moved a very hearty vote of thanks to the President for the address he had given.

Mr. CAMPION said that as he had unfortunately been unable to induct the President to the chair at the last meeting, he availed himself of the present opportunity of seconding Mr. Hopson's vote of thanks. After hearing the President's address that evening, he was sure all the members would look forward with supreme confidence to the initiative which he would give to the Society during his term of office. He himself looked forward with great pleasure to the result of the session's meetings under the President's guidance, and he was sure the Society would congratulate itself as much at the close of Mr. Lewis Payne's term of office as it did at the commencement of that period.

The vote of thanks was carried by acclamation.

The PRESIDENT thanked Mr. Hopson, his old friend and colleague, and Mr. Campion, who had so recently and so ably occupied the chair, for their kind words, and the members for the vote they had passed.

ORTHODONTIC EDUCATION.

By H. T. A. McKEAG, B.D.Sc. (Univ. Dub.).

Mr. McKEAG, before reading his paper, said he felt some diffidence in presenting a paper on "Orthodontic Education" to the Society, but he had felt impelled to do so, first because he was convinced of the importance of the subject, and secondly because no one else seemed inclined to deal with it. His second reason had been removed by the President that evening, who had dealt with the question far more eloquently than he himself was able to do ; but what the President had said had more than even convinced him of its importance, and that would be his excuse.

I AM convinced that there is a very great demand for orthodontic treatment and that that demand is not being met in anything approaching an adequate manner. When I say demand, I do not mean merely a need ; I mean that parents are asking for treatment for their children and are not getting it ; are being told that nothing can be done, that the teeth will come right, that the irregularity is not worth bothering about, that it is just the natural shape of the mouth ; are being told all sorts of things in perfect sincerity, but in comparatively few cases are being given the help they need. Further I believe a considerable amount of harm is being done because the necessity for orthodontic treatment is not being recognised either by parents or dentists sufficiently early, so that when it is recognised, treatment so elaborate is required that the complexity of the case deters the majority of men from attempting any cure at all, or makes them fall back on a compromise that does not represent the best that might be done ; or, again, expense may render the elaborate treatment impossible. In addition irregularities are not infrequently being brought about by premature extraction which would not have been resorted to were its results, from the orthodontic point of view, properly understood.

Now the responsibility for this state of things does not rest with dentists as such. An overwhelming majority of them I believe are really desirous of doing everything that can be done for the dental welfare of the children who come under their care, and if they do not see their way to do what is required themselves are eager to send them where there is a chance of their getting the necessary attention. The responsibility lies with dental education, or rather with its limitations. I think my own undergraduate education in orthodontics was as complete as is given anywhere, yet I imagine my instructors would have been the last to assert that it was sufficient to enable me to carry out the amount of orthodontics that commonly falls to the lot of the general dental practitioner. I may quote the expressed opinion of the professor of orthodontics at one of the largest and best dental schools in the U.S.A., that the maximum of orthodontic training possible in the undergraduate course was so limited that it was precisely those students who had most experience of the subject who afterwards in general practice were least inclined to undertake the work. It is only possible to give enough training to indicate the difficulties. There is so much to be learnt and taught in the two years or a little more that are allotted to purely dental work that orthodontics has been, and I think of necessity must be, somewhat crowded out. More time to devote to the subject could only be obtained at the expense of other matters, and the ever-increasing amount of knowledge and skill to be imparted in every branch of dental science and practice puts this out of the question. Orthodontics has, I believe, of late years expanded beyond the limits of what can be taught in the four-year undergraduate course. It is not irrelevant in this connection to mention that Mr. Norman Bennett has devoted more than a quarter of his book on Dental Surgery to the subject, and even at the time of its publication none of us would have complained had the contributors written at even greater length upon it, while a considerable amount has been added to our knowledge since then.

I am by no means asking that orthodontics should be eliminated from the undergraduate course. Rather I think that at least as

much time should be devoted to it in future as is now the case, and probably by improving clinical facilities and by careful consideration of the syllabus, something might be done to give a better grasp of the subject to those who do not propose to take more than a general interest in it. But my intention is to put in a plea for more extended opportunities of learning for those who have qualified and wish to make a special study of orthodontics, whether for the purpose of specialising in it to the exclusion of other branches of dentistry, or not.

The great argument in favour of specialisation is the necessity for research. There is no need before such a society as this to urge the importance of orthodontic research. We realise more and more the limits of our knowledge and the extent of our subject. The continual introduction of new mechanical contrivances, or modifications of old ones, for controlling the position of the teeth is sufficient to convince one that even in that direction we are far from perfection, and improvement in such appliances is by no means the only, or the most important, need. How little we know of the causes of irregularities, and how essential to proper prevention and treatment that knowledge is. For the general dental practitioner, especially in the provinces, no matter how much he may be interested, such research is at least extremely difficult. There are so many matters claiming attention. A man may not serve two masters, and a really enthusiastic devotion to orthodontics would result, unless in the case of an exceptional man, in the neglect of other matters equally vital to general practice.

But from the point of view of meeting the demand for orthodontic treatment, it seems to me immaterial whether the work is done by specialists or general practitioners. While I believe in specialisation, I believe also in the need for a more thorough practice of orthodontics by those who do not specialise. This can only be attained by providing better educational facilities. There are, I know, many who would devote more time and attention to the subject were it possible without great expenditure of time and money to get a good grounding in its principles and practice.

This paper represents frankly a personal point of view, so I shall make no apology for giving my own experiences when I set out, not very long ago, to find some school which would make me if not a complete orthodontist, at least one who could start practice with as much confidence in his scientific and technical equipment as a dentist might have in his. I discovered very soon that neither in this country nor in the U.S.A. did such a school exist. In the United Kingdom, of properly organised and equipped postgraduate courses, there were none. In America there were some short intensive courses in orthodontic science and technique, but they had the serious disadvantage that, being run by private enterprise, they did not offer the absolutely essential facilities for gaining clinical experience. Ultimately, through the very great kindness of personal friends, and of a number of orthodontists in the U.S.A., I was able to gather together an amount of knowledge and experience that was as near my requirements as seemed possible to obtain in the existing circumstances, but which I do not consider represents the maximum that could be gained in the time were organised instruction available. And I may point out that it would be considerably more difficult for others, less fortunately placed, to obtain even so much experience as I did. Apart from that I

cannot see why it should be necessary for students to go to America. The expense is in itself a very great deterrent ; and if we have, as I believe we have, as good dental schools in this country as there are on the other side of the Atlantic, I do not know of any reason why we should not bring our orthodontic education to an equal standing also.

There is little hope, I suppose, of being able to get an ideal school at once, but I should like to indicate what seem to me the lines upon which work should be started, and what should be aimed at. Eventually I hope to see a permanent school with its own clinic, at which students can obtain practical experience concurrently with and subsequent to the training in theory and technique. Financial difficulties and the initial uncertainty as to the number of students, put that out of court at present. Practical considerations point to a course of ten or twelve weeks.

In planning a curriculum the central idea should be to give as sound a knowledge as possible of the principles, physiological and mechanical, on which orthodontic work is based. Our knowledge of these is limited indeed, but if we aim at teaching thoroughly what is known, and indicating the need for further study and the lines along which it should be made, we shall be rendering a far greater service both to the individual student and to the science than if we aim merely at perfecting technique in some particular form of mechanical appliance or at making the student familiar with as great a number of appliances, or of varieties of malocclusion, as possible.

Foremost amongst these basic subjects I would put what I can only call the study of normal occlusion. It is absolutely essential that anyone setting out to correct abnormalities should have a clear idea of what normal is, not only that he may realise at what he is aiming, but that he may recognise with what form of abnormality he is dealing. The importance of the matter has been emphasised a good deal recently, and we have had to reconsider our ideas of what normal occlusion is ; and there is no doubt in my own mind that the subject merits inclusion in any course as a separate branch of study. With it would be included the classification of abnormalities.

Etiology, with which I would combine prevention, is a branch to which I think a great deal of attention should be given, both to impart what is already known and to direct research along right lines. Its very intimate connection with treatment, too, requires adequate presentment.

The third theoretical subject to be dealt with would be the nature of the process of tooth movement, with the growth and reconstruction of bone ; and very strong emphasis needs to be put on the importance of the matter in the designing of appliances.

Lastly, I should like to enter a plea for a few lectures on the theory of mechanics, or, to avoid confusion in terminology, I will say on certain parts of natural science. There is no need for elaborate formulæ and calculations to be taught, but a knowledge of the laws governing the application of forces through springs, screws, inclined planes and levers would be of very great service indeed.

When we turn to practical training in technique the difficulty arises as to which out of the multitude of mechanical contrivances available shall be chosen for demonstration and clinical use. It is

manifestly impossible to teach them all, and none has as yet emerged as the universal appliance, nor has finality by any means been reached. A knowledge of the principles of physiology and mechanics which should govern design, will enable the student to select among the existing patterns and those which will continue to appear, and consequently most attention should be given to imparting sound technique in soldering, wire bending, and band making; while a collection of models bearing examples of the appliances in most common use will serve to illustrate the tendencies of design and the adaptation of the means at our disposal to particular purposes. In clinical practice some few patterns must be adopted, but their choice may I think be left to the individual instructors.

As regards organisation I do not propose to say much. If the school is not to be a permanent one the difficulty arises as to the provision of a clinic. Since treatment of cases started must be carried to a conclusion, which cannot be done during a short course, no temporary arrangement is possible. My suggestion is that the course should be run in conjunction with one of the established dental schools, where a permanent orthodontic clinic would be available in which cases could be seen in all stages of treatment, and where undergraduates would be able to carry on work started. It would be of very great advantage also if a number of students on completion of the short course could be given the opportunity to continue work at the clinic. Those attending the post-graduate school who were already in dental practice would not generally be in a position to make use of such facilities, but there would be a number of students not yet in practice who would not only need the practical experience thus to be gained, but would be eager to make use of any such opportunities given them.

It would be in my opinion essential at first to get one or two instructors from the U.S.A. We may as well admit that orthodontics has made a great deal more progress in America than it has in this country, and while it does not logically follow that an orthodontist who comes from the other side of the Atlantic must be a greater authority on the subject than one from this side, yet undoubtedly the presence of one who had established a reputation in orthodontic work in a country where it is so widely practised would lend weight to the school and attract students who might otherwise under-rate the value of a purely local teaching staff.

I am aware that very considerable difficulties are likely to be met in establishing such a school as I have outlined, or indeed any school that would be of real value. It is impossible for one living, as I do, so far from the centre of things dental, to take any active steps in the matter, or even to examine into the details of what might be done, but I hope that by urging the importance of the subject I may arouse interest and discussion amongst those who are better placed to find a solution of those difficulties, and that before long such a solution may actually be found.

Mr. McKEAG concluded his paper by saying that he hoped, by giving as definite an outline to his theme as possible, to provoke discussion, which was the first step towards getting something done.

The PRESIDENT said the Society was very much indebted to Mr. McKeag for coming from Belfast to read his paper, and was particularly grateful to him for the manner in which he had presented his subject. Mr. McKeag had been labouring under considerable difficulties by being such a distance from other orthodonticians, and therefore being unable to confer with them.

Mr. J. H. BADCOCK agreed with the President and Mr. McKeag that something ought to be done, and done quickly, in the matter, because there was, as was well-known, a great demand for orthodontic treatment, and a great deficiency of men who were able to give it, up and down the country. If one were treating the case of a child who was obliged to go away to some other part of the country—perhaps to school—one had the greatest possible difficulty in finding anyone to whom the care of the case could be entrusted. Here and there, of course, were men to whom a case could be entrusted with perfect confidence, but there ought to be someone in every town able to do the work. He believed that the general dental practitioner ought to be able to treat ordinary cases quite well, and without interfering with his general practice. At the present time the average general practitioner felt that he did not know very much about the subject, and that it would take up a great deal of his time, for, probably, a very inadequate reward; he therefore disliked the idea of touching cases of that kind. The remedy for that state of affairs was not easy to see. A post-graduate course would be of very great value, and he thought every possible effort ought to be made to arrange for some such course; he also heartily agreed with everything Mr. McKeag had said with regard to the training of students. Every student before he took his diploma, should have a knowledge—at any rate of the rudiments and perhaps of even more than the rudiments—of the principles underlying orthodontic treatment. If that were so he would be able to deal with the vast majority of the work, because the majority of the cases of irregularity of the teeth were fairly simple and, if taken at the right time, easily dealt with by a general practitioner if he knew how to deal with them. He himself felt it was quite time the general practitioner was taught, both as a student and afterwards, if he had not had the opportunity of learning as a student.

Mr. SHELDON FRIEL thought the Society owed a great debt to Mr. McKeag for coming to London to deliver his paper. The subject was a most important one, and he agreed with Mr. McKeag's division of it into the teaching of the student and the teaching of the qualified practitioner. Mr. McKeag went into very few details about the teaching of the student, and personally he thought the teaching of treatment to students was out of the question. The dental course was already so large that if orthodontic treatment were to be added some other subjects would have to be dropped. If, however, students were taught the principles on which orthodontics was founded, when they qualified they would have something on which to build up a knowledge of orthodontic practice, if their tastes lay in that direction. The principles were the study of normal etiology and prevention. The general practitioner in dentistry saw the children when they were young, and he should be able to prevent irregularities arising. Most irregularities could be stopped if they were recognised early enough, but if left alone they might become impossible to cure. Students should be taught to recognise such cases, and if possible to prevent them occurring. With regard to post-graduate courses, he did not think very much would be gained by teaching *general* practitioners to practise orthodontics; he thought they must be taught as specialists. If a man was keen on orthodontics it meant that he must sacrifice his general dentistry work. Mr. McKeag had said that no man could serve two masters, and personally he agreed that that was true, especially as applied to research. The general practitioner had no time to carry out research work; he was tired out at the end of the day, and his time was fully occupied in other directions. In specialist practice, on the other hand, the hours were not so long; a considerable amount of time was available for research, and the specialist saw such a number of cases that he had plenty of material to hand for research, if he cared to take it up. Great difficulties would be experienced in starting a post-graduate course. There were large numbers of different systems and appliances which different people wished to put forward, and it would take a great deal of tact to form a post-graduate

course which would include only such things as were essential. He thought, however, that it could be done, and he suggested that a committee of the Society should be formed to inquire into the whole subject of orthodontic education and to report to a later meeting. A small committee could do a great deal more than a large meeting. A large meeting resulted in very little beyond discussion, as a rule, but something might result if a committee was formed. It seemed ridiculous that while in America there were something like two hundred orthodontic specialists, in England there was not a single one. Dublin and Belfast were each able to support a specialist, and it did not seem right that London should be unable to do the same; moreover, there would shortly, he understood, be two specialists in Dublin.

Mr. A. T. PITTS said all the members agreed that the teaching of orthodontics was not as good as it should be, but the way to improvement was fraught with difficulties, which, though not insuperable, yet had to be faced. One of those difficulties was that orthodontics was a subject which required very long views. At the present time the student rarely saw the completion of any but a very simple case, and that encouraged dogmatism on the part of the teachers which the student had no means of checking. That, of course, was true in regard to other branches of dentistry, but not to the same extent. A post-graduate course of an intensive type, calculated to turn out a complete orthodontist in twelve weeks, might be undesirable in that it would give rise to tremendous dogmatism, because the students would never have a chance of seeing how far the principles taught were really valid. It took from three or five years, as was well-known, before anyone could say that a particular treatment was really sound. The methods of fitting the various appliances, and the different types of appliances, could be taught, but that was not really the teaching of orthodontics. The question had been raised by the previous speaker as to whether orthodontics could be taught to the general dental practitioner. The question should be considered seriously before it was decided that there was no place for orthodontics in general dental practice. The increasing tendency to specialisation manifest in the present age had brought in its train narrow views and outlooks on life, and if specialisation in what was already a narrow subject—dentistry—was introduced, he did not think it would make for broad views, or be advantageous in the long run. The splitting-up of dentistry such as had taken place in America, had not, he thought, proved an unmixed blessing. Dealing with research, he thought the man who saw the general side of dentistry was often in a position to do valuable work in orthodontics; some of the most stimulating research had come from outside dentistry—notably the brilliant suggestions of Professor Keith, which had thrown a flood of light on some orthodontic questions.

Mr. CAMPION wished to join with other speakers in congratulating Mr. McKeag on the importance of the subject he had chosen for his paper, and on the manner in which he had dealt with it. Mr. McKeag had emphasised four aspects of the matter, which he called the scientific, the technical, the physiological and the mechanical, but personally he thought there was another equally as important as those—the artistic. A knowledge of the artistic points about the face should be imparted in any course of instruction, and be known to everyone who practised orthodontics, just as much as a knowledge of the normal arch or the way to right abnormalities. It must not be forgotten that a normal series of arches might be misplaced in the face, and, after all, orthodontists were working to improve the facial conditions of many of their patients, and that made their work very much akin to the knowledge which had to be acquired by a portrait-painter or a sculptor. It demanded a very close and intimate knowledge of the different types of face, and a full realisation of the changes which took place in the face from eight or nine years of age up to maturity. Those points were extremely difficult and extremely subtle—so subtle that they could not be expressed in the clumsy machinery of words. An artist or sculptor took from ten to twenty years to acquire that

detailed knowledge of the face which was necessary for his work. An orthodontist did not require, perhaps, to study the matter so closely as that, but did require a knowledge of the changes that occurred between childhood and maturity, and must realise that orthodontic treatment must have in view the artistic qualities of the face. An artist would say that certain things were wanted in a portrait, but it was very difficult for one not versed in his knowledge to understand why, or perhaps even to realise their absence. The subtlety necessary seemed to approximate to that inexpressible knowledge—gustatory knowledge—which enabled a man to appreciate the qualities of a well-grilled fresh herring! Before one could do justice to a face one had to know what the development of that face would be, and how it could be influenced and improved by orthodontic methods. That aspect of the question seemed to him most important, and in his view would render a prolonged course necessary. The beginning of orthodontic treatment should not be a study of the arches, but a study of the face. When that aspect of the matter was added to the technical and scientific aspects, it would be seen that the course must take a long time. In conclusion, he wished to thank Mr. McKeag for his paper.

Mr. GEORGE NORTHCROFT said that in a tentative way, and realising its limitations, they had tried at the London Hospital to introduce the question by a course, which they called by a term often derided, but which had a great deal more sense in it than some people seemed to be aware—odonto-prosopic orthopœdics. That term contained the elements of all the study that was necessary to elucidate the subject. Mr. Campion had given voice to the idea—which was widely shared—that it was necessary to include the prosopic aspect of the question in any study of orthodontics. It might be remembered that when the name of the Society was first discussed he had tried to secure the adoption of the name “Odonto-Prosopic Orthopœdics” which exactly expressed what had to be studied.

The PRESIDENT thought it would be generally agreed that Mr. Friel's suggestion that a committee should be formed to consider the subject of orthodontic education was a good one, and he would see that the suggestion was brought before the Council at an early meeting. He called upon Mr. McKeag to reply to the discussion.

Mr. McKEAG, replying to the discussion, said that his suggestion of a course was frankly intended as a compromise. If one tried to attain the ideal right away one would aim at a course which would be very admirable in many respects, but from a practical point of view quite out of the question. He held no brief for a ten or twelve weeks' course at all; he would prefer ten years in general dental practice and then five years' study. He suggested a short course because he was looking at the matter from the point of view of the demand. There was a tremendous demand, and if they were going to try to meet it they had to start first of all with a compromise. On that account he thought Mr. Friel's demand for a course for specialists only was unsound, as it had the great defect of not making any real attempt to meet the situation. There were not enough men who really wanted to become specialists. The teaching of the underlying principles of orthodontics in a post-graduate course was frankly a compromise, because he thought they should really be taught in the undergraduate course. Those principles were equally essential to the general practitioner and the specialist, and therefore they ought to be taught in the undergraduate course; but in the majority of cases that was not done. If the demand for orthodontic treatment was to be met they had to be taught at some time or other, and that was why he advocated putting them into the post-graduate course. There were of course, all sorts of other objections to the course. The fact that dogmatism would be encouraged, and that students would not be able to verify what they were taught in a short course constituted a great difficulty; but a compromise was necessary, and the only compromise that seemed to him possible was a short course. It took a

very long time—four or five years had been mentioned—to see whether the theories taught worked out properly, and a post-graduate course could not be made to last five years. He had recognised the importance of the point raised by Mr. Champion, but he had not included it in his paper on that account. He must confess to almost “funking” the artistic side. There was such a tremendous amount to be learned in that direction that there was always a temptation to concentrate on matters more closely allied to the study of orthodontics. He had been introduced to the artistic side of the question by Mr. Friel some years ago, and although he had taken a great interest in it he confessed he had not got much “forrader” since. It was a very difficult subject, and knowledge of the effects of development, and particularly of the development of the teeth, on the appearance of a child was so limited, that one could not put anything into practice or even teach anything with any confidence. If there was an instructor who could teach the subject with confidence he should certainly be on the staff of the course, but as he knew no one who could claim to fulfil that condition he had not referred to the matter in his paper. The same argument might possibly be applied to other points in the course, but in every other subject there was a certain amount which was definitely known and proved. He did not claim to have done more than suggest what appeared to him to be the most attractive compromise possible. He hoped the committee which had been suggested would be appointed and get to work as soon as possible.

The PRESIDENT, in the name of all present, thanked Mr. Chapman for his Casual Communication and Mr. McKeag for his Paper.

The meeting then terminated.

A MEETING of the British Society for the Study of Orthodontics was held at 11, Chandos Street, Cavendish Square, W., on Wednesday, February 9th, 1921, Mr. J. LEWIN PAYNE, President, in the chair.

The minutes of the previous meeting were read and confirmed.

The following newly-elected members, who were present for the first time, signed the Obligation Book: Messrs. J. K. Grayson and J. L. Byron.

ELECTION OF CANDIDATES.

A ballot was taken and Messrs. Eric N. Commander, L.D.S. Glas., of 11, Crosbie Road, Birmingham, and Wm. Jones, L.D.S. Eng. and Edin., of 2, Colosseum Terrace, N.W.1, were duly elected.

The following visitors were present: Messrs. Berry, du Toit, Raneford, Gardner, Commander, Wilshire and Parker.

CASUAL COMMUNICATION.

CASE OF LIP-SUCKING COMPLICATED BY RICKETS.

By B. MAXWELL STEPHENS, L.D.S.

I WAS afforded the opportunity of inspecting this case at intervals by the practitioner who treated it. He has kindly sent me models which he recently secured. A comparison of these (Figs. 8, 9, 10, 11) with the first (Figs. 1, 2, 3, 4) shows a good result, and as I think there is something to be learnt from it, I have brought the case forward as a casual communication.

Rough notes from the history read as follows: Boy aged eight and a half years; has always lived in the country; mentally, lacks power of concentration; physically, well developed but stoops.

His lower lip is drawn in behind his upper incisor teeth, where he always seems to be sucking at it; these teeth are fairly prominent.

The mental prominence is flattened, and though the mandible is actually only slightly retruded, the profile of the face has a semblance to that of one with a chop-chin.

There is no history of similar dental malformation among his family, though in passing, and it is of interest, there is one of hyper-secretion of the thyroid gland.

Inquiry as to conditions in infancy showed that he was bottle-fed, rickety, cut his teeth late, only commenced to walk at three years of age. At five and a half years adenoids were removed; following this operation he has always breathed normally.

You will see from inspection of the models, that the teeth are large, and that the lower incisors have been shot up irregularly (Fig. 2), into the upper arch (Fig. 1), the buccal surfaces of the centrals being, if one may misuse the term, in lingual occlusion with the palate. There is some narrowing both of the maxillary and mandibular arches in the molar and premolar region, with marked lingual tilting of the first lower molars. The correction of this tilting would considerably shorten the length of the overbite. Obviously these arches lacked growth in the early stages of dentition.

The central incisors erupted, but lateral pressure created by the development of the laterals and canines and the actual eruption of the former, forced them upward until they impinged upon the soft tissues of the palatal margin.

The child experiencing discomfort, interposed the lower lip as a shield, thereby causing the centrals to be thrust further inwards; these caught into the vault of the palate (Fig. 1), the malformation was completed.

Treatment consisted in capping the deciduous lower molars, thus lifting the bite from the permanent molars which were then thrust outward by finger springs; this increased their height in the arch. By finger springs also the lower incisors were gradually pushed forward, and at the same time an upper biting plate was inserted to assist in depressing them. Later, both arches were expanded.

The last models were taken when the boy was twelve; the operation from various circumstances spread itself over three years, but opportunity was unfortunately lacking to complete the expansion of the arch in the molar region.

I wish, in concluding, to make two points:

1. That where there is lack of development, the deciduous arch should be spread early enough to ensure sufficient space for the incisors and canines to develop and erupt freely; preferably about six years.

2. That though, at first sight, the prognosis of this type of case would appear to be unsatisfactory, with tenacity on the part of the operator, a simple line of treatment brings about a normal resolution of the malformation; but the etiology must be carefully studied.

The second case I wish to show is one of unilateral distocclusion with marked overbite. This child, a girl aged four and a half years, took one and a quarter hours to eat her mid-day meal of meat, vegetables, and some form of cereal pudding. Though there was little decay visible, it luckily suggested itself to the nurse that something else might be wrong with the teeth, and she was brought to me. I took impressions and when these had been cast, an examination of the lingual aspect of the occlusion showed only a minimum surface of the molar teeth in opposition, and that the lower incisors impinged upon the opposing palatal surface. (Figs. 12, 13, 14, 15.)

The time to-night is too short to go into the etiology of this malocclusion, which would otherwise prove of interest. I will therefore pass on to a short survey of the child's general condition.

As she sat in my chair she was lethargic and obviously lacked energy: it seemed to me that a vicious circle, initiated from want of masticatory power, had probably been set up embracing the digestive tract: food insufficiently prepared for further digestion had been passing into the stomach. I found she had become habitually constipated. She was thus constantly re-absorbing products from the material which should have been evacuated.

By way of treatment I inserted a biting plate (raising the bite in the incisor region) with a small-sized Badcock screw to accomplish expan-

CASE OF LIP-SUCKING COMPLICATED BY RICKETS.

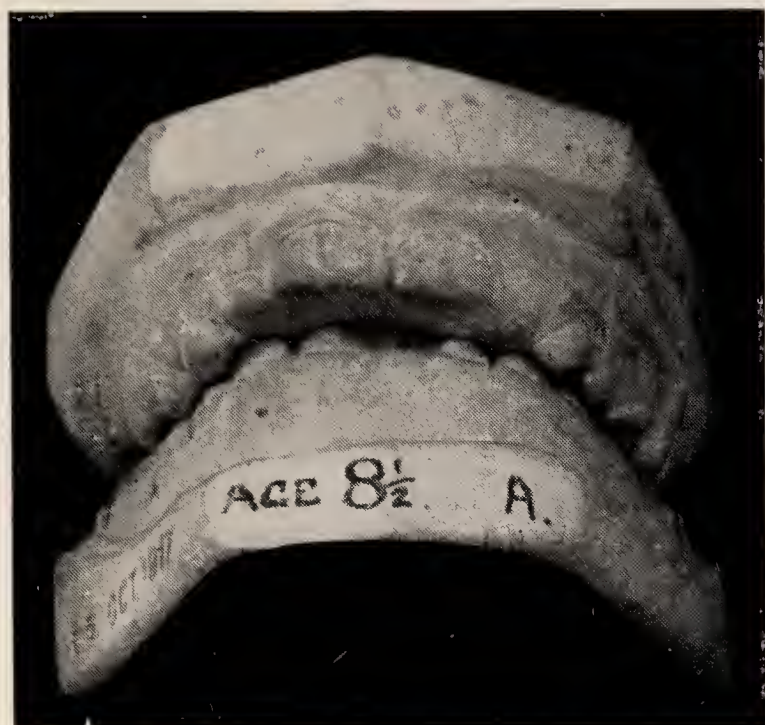


FIG. 1.—Frontal view. Model, tilted showing lower central incisors caught within palatal vault.



FIG. 2.—Occlusal view, showing bunching of lower incisors.



FIG. 3.—Right lateral view. Permanent lower molar in distocclusion.

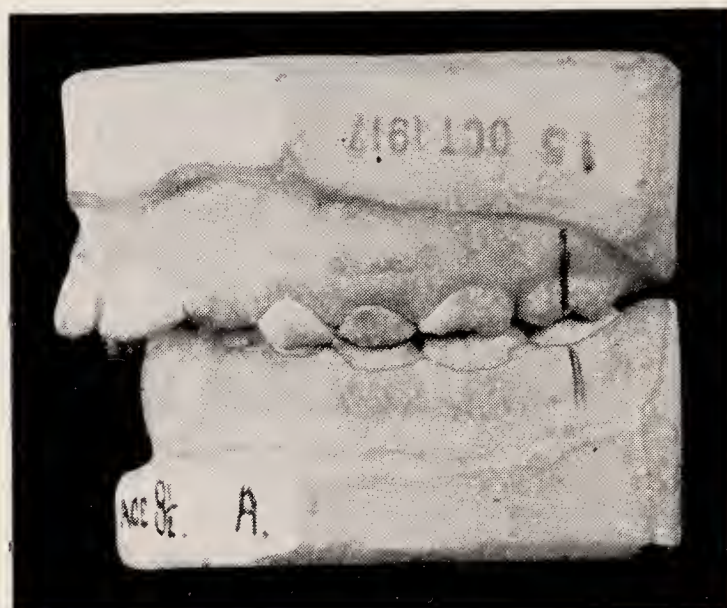


FIG. 4.—Left lateral view. Permanent lower molar in distocclusion.



FIG. 5.—Frontal view, showing movement forward of lower incisors (intermediate stage).

CASE OF LIP-SUCKING COMPLICATED BY RICKETS.

FIG. 6.
Occlusal view.

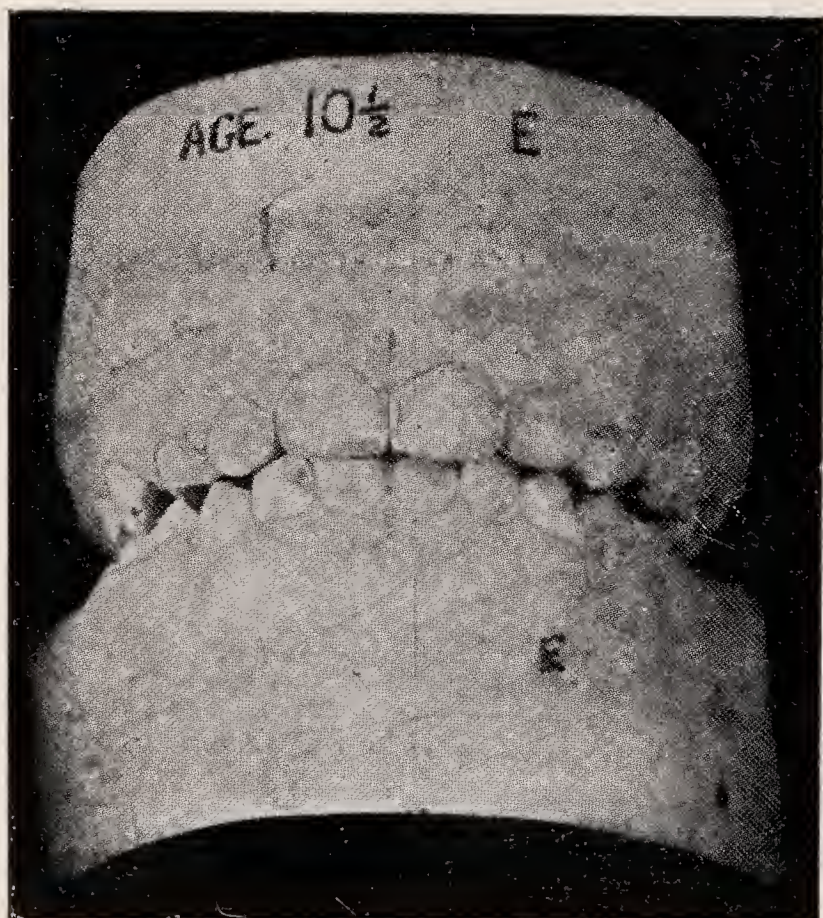


FIG. 7.—Frontal view. Final stage.



FIG. 8.—Occlusal view. Final stage.

of lower incisors (intermediate stage).
showing movement of lower incisors (intermediate stage).

CASE OF LIP-SUCKING COMPLICATED BY RICKETS.



FIG. 9.—Right lateral view, intermediate stage, showing forward movement of mandible.

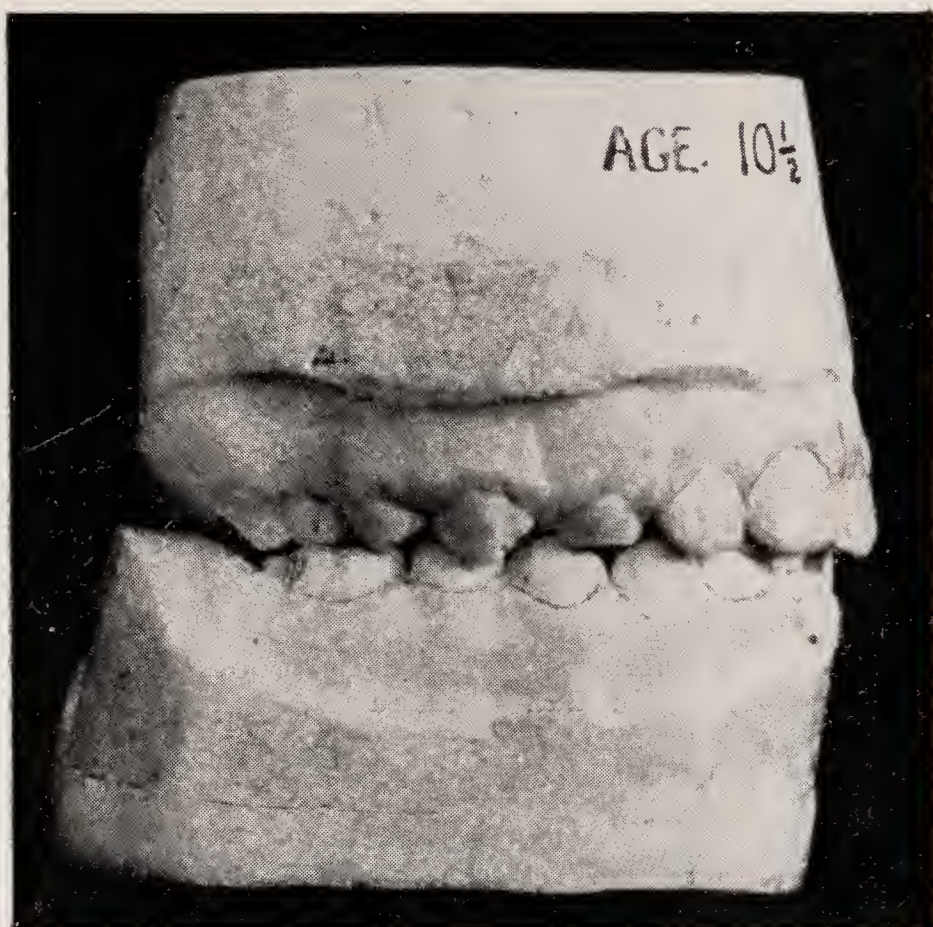


FIG. 10.—Right lateral view, Final stage.

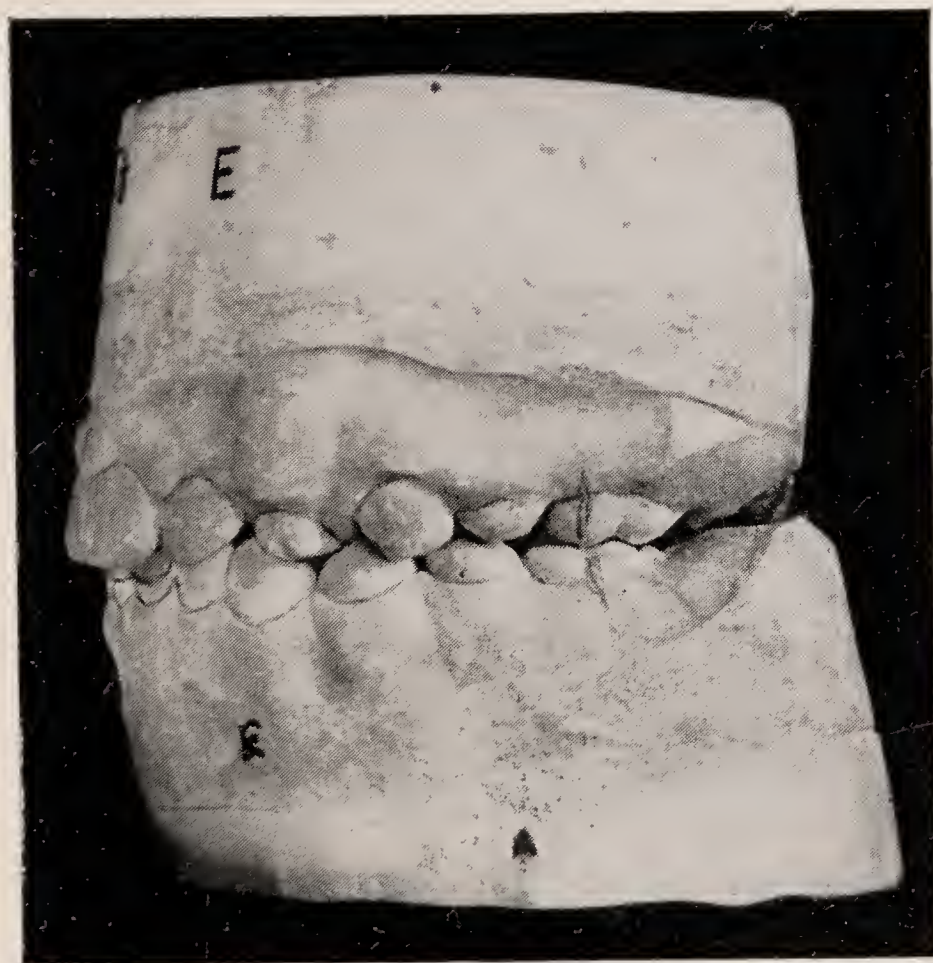


FIG. 11.—Left lateral view. Final stage.

CASE OF LIP-SUCKING COMPLICATED BY RICKETS.



FIG. 12.—Showing depth of overbite.
Observe misplacement to right of
centre in mandibular arch.

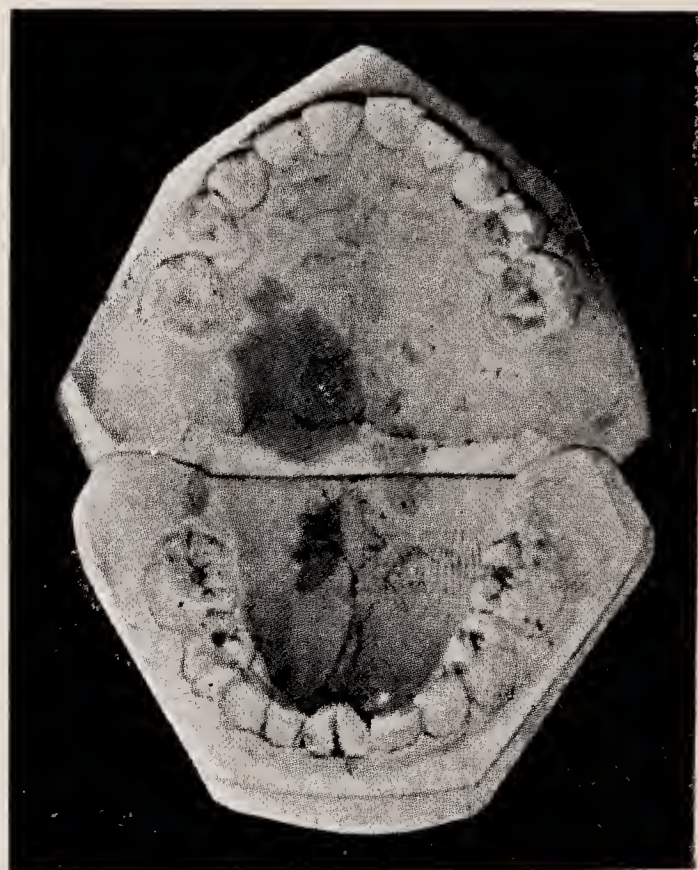


FIG. 13.—Occlusal view, showing partial
rotation of lower central incisor.



FIG. 14.—Left lateral view, showing
occlusion of second molars practically
normal.



FIG. 15.—Right lateral, showing distal
occlusion of second molars

sion. As soon as she had become used to the presence of the plate, I severed it in the usual manner and began spreading the arch.

After a couple of weeks she commenced to masticate her food quite comfortably on the plate; her general tone improved, the mentality was quicker and she was full of movement. Seeing her after an interval of two months, I scarcely recognised the individual.

At the end of five months, I started expansion by a plate in the lower arch, so as to restore support to the bite in the molar region. At this stage I usually substitute a biting plate without the expansion screw, as this overcomes the difficulty which occurs when the child is eating.

I am led to make the following remarks, the first of which is practically a reiteration of the conclusion in the previous case—namely, that if the arches were not being spread early there would be insufficient room for the lower incisors to erupt, and this case would otherwise pass on and enter the same category as the preceding one.

The second is, that it is no exception of course to meet with this type of case in practice, but that when I observe there is much overbite, not having already done so, I examine the child's whole being critically. I ask whoever is with them, among other questions, if the meals are eaten slowly and whether meat causes a difficulty in mastication? If the answer is in the affirmative I secure impressions, and with very young patients this demands both strategy and patience.

The advisability of treatment can then be considered and the condition explained. It is essential that we should bring to the notice of the medical attendant and the parents the evil effect of leaving these youngsters to struggle on with a dentition with which they cannot masticate. Treatment should never voluntarily be delayed.

It should be borne in mind that at this stage simple forms of appliance to a large extent correct the tendencies to malocclusion; such appliances are readily worn and their presence in the mouth is, as a rule, not resented to the same extent as later on; also visits can be obtained without interfering with the schooling.

It remains to add that we should use every opportunity of educating ourselves sufficiently by study and observation of the normal, to be able to detect at once the earliest signs of the abnormal.

THOUGHTS ON ORTHODONTIC TEACHING WITH PRACTICAL RESULTS.

Illustrated by Lantern Slides of Models of Cases before, during and after-Treatment.

By G. F. CALE MATTHEWS, L.D.S.

THE invitation to give a paper before this Society finds me in a position of apprehension. The difficulty is the choice of a subject. To choose any one special part of the great specialisation of orthodontia and present anything new, may only involve us in a debate, which will have no definite result, and the value be lost in side issues which bulk so largely in any discussion.

Experience of twenty years of orthodontic study and practice and some ten years of active and definite teaching have led me to some conclusions which I venture to put before you this evening, in the hope that something may result which will afford us an interest which is at the moment lacking.

I do not propose to enter into any questions to-night of treatment, diagnosis or apparatus, but to generalise on the question of orthodontia and the attitude the profession takes in regard to its practice. Is it one of silent contempt due to many causes? Or, is the lack of interest due to the great amount of work which awaits us and prevents research in this and so many branches of our speciality? May I digress for a moment and ask your permission to state briefly the position of orthodontia in this country? This

Society was formed by a few enthusiasts to study orthodontia as a live science, and one may assume thereby to be helpful to the profession and through it to the nation. After years, what is the result—a very small Society doing a useful work in a very limited sphere—its meetings largely confined to individual criticism and ideas of treatment—no enlarged view of the usefulness of work that may be done and should be encouraged—and in consequence still an indefinite idea in the mind of the average general practitioner that orthodontia is anything more than a fad and only for the specialist, and cannot be undertaken save at great personal worry and disappointment.

With this attitude I entirely agree and for this reason that no endeavour has been made by individual or school to educate and instruct the profession or public in the value of skilled treatment. It must be remembered that the bulk of practitioners do not read any great amount of current dental literature.

A difficulty to combat is the lack of appreciation of the principles involved in the discussion of any point (apart from the obviously simple), which is so entirely essential in the study and practice of orthodontia, and with all respect to some, treatment so often follows a line of compromise that the underlying principles probably get lost in the transaction. Too often difficulties are foreseen which never arise, likewise too, cases are regarded as quite simple which involve considerable treatment to correct a slight deformity; often, too, cases presenting apparently considerable difficulty suddenly resolve themselves beyond one's most sanguine expectations. How to deal with all types in so confident a manner that all anxiety can be eliminated is still far from possible, and may never be probable, but it is only by constant observation and the close attention of many workers that any advance is likely to come.

Thus the casual worker in private general practice can hope to get very little further, as the limitations are too manifest to allow of sufficient experience.

"*Experientia docet*" might easily be the title of this small paper, and not in the satisfied sense of the egoist, but in the wider sense of a limited satisfaction of small things accomplished and hope of greater things to come. Experience is the ablest teacher in the school of Orthodontia, and this makes the practice so unalluring to the many, the opportunities of gaining the necessary experience being limited to the practice which must be done but is not encouraged; but the responsibility is still heavy on those lonely practitioners who make no practical effort to deal with the subject, and leave their patients to grow up with existing deformities or mutilated dentures.

A few enthusiasts whom we all know are called upon time and time again to diagnose and give an opinion on a case which is of special interest to a given practitioner. If that opinion is asked for in an open meeting by means of a casual communication the immediate result is most likely to develop into a debate on a particular type of mechanical device, which may or may not be within the mechanical ability of the practitioner to operate, so the incident closes without anything definite having been derived, and the seeker after information possibly and probably retires from the fray in a more confused mental condition than before he asked for information. Now it is obvious that it is quite an impossible task

to define treatment of a case to anyone not thoroughly versed in the whole theory and practice of orthodontia as recognised with the present knowledge and experience. The schools have persistently refused to recognise the subject with any definite syllabus and practice, and the final examinations are devoid of any real appreciation of the value of its practice to the qualifying student. The lack of any definite teaching leaves men to their own resources and their inclinations being possibly toward the easiest solution of an apparent and present deformity, a treatment is adopted which may ultimately ruin a denture which could have easily been rendered efficient and artistic.

So much could be done if the schools would adopt a definite system of teaching, recognising that orthodontia has proved its right to be considered an important part of a student's curriculum, and that it is quite as important to know how to treat the deformity existing in a child's developing denture as to place sixty or eighty more or less indifferent gold fillings in teeth which could be equally well filled and perhaps more lastingly preserved with other materials.

The difficulty of obtaining teachers must for some time be considerable—no one should be allowed to take full responsibility in this work whose only credentials are theoretical—a wide experience of actual practice should be a *sine qua non*. This under our present system is impossible, but with a wider outlook sufficient enthusiasm should be forthcoming to make this both possible and remunerative. The question of the "right to live" may have some effect on the situation, but given the right man with proved ability, the support of his colleagues should be sufficient to free him from financial anxiety. An essential trait in the successful practice of orthodontia must be a real fondness for children, with unlimited patience if necessary. These advantages are not possessed by all and it is well for the man who thinks of specialisation to consider these two essentials before embarking on this work.

With a desire to get something definite decided, a teaching method was started at the Birmingham Dental Hospital on standardised lines.

After a little time, two or three years, sufficient impression had been made on my colleagues for them to agree to some change in the curriculum, and coincident with this I was appointed lecturer at the University. Now there was some responsibility and with that responsibility the opportunity to get to work. No originality can be claimed for the syllabus as given—it is obvious that headings of lectures can only convey limited meanings; but the point is that by combining the work of lecturer and orthodontic surgeon one can carry one's work through on a regular plan. It has been a one man show entirely; in this sense, that it has been a lone road to travel and one has had none of the advantages of discussion with one's colleagues such as could occur in London, and with the exception of an occasional chat during a visit, experience and reading have been the only guides possible. Our duty as teachers I understand to be the efficient training of the average man to regard his professional obligations seriously and to render him capable of recognising the various pathological conditions, and when he may be called upon to treat them, to do so with the best that is in him. If any part of his curriculum is deficient, so much is lost to him and to those who come under his care.

To illustrate the entire apathy of the profession toward

orthodontic practice one has only to realise that no one is specialising in the whole country with its 40,000,000 of population and the perniciously ignorant practice of extraction still holds sway.

Why are there not fifty orthodontists practising in this the greatest city in the world? It cannot be through insufficient work to be done. Is it our curious national disinclination to split our work? Is it a dislike of or disbelief in the work itself? Or is it a false premise that no one in this very conservative country of ours would have the support of his colleagues to enable him to exist? I do not venture to reply to these questions.

The responsibility of the school dentist is very heavy in this respect, but the difficulty must be overwhelming. Only the simplest of cases could be treated with the time at his disposal. What is the remedy for all this well-known deficiency?—the establishment of clinics for orthodontia work only, which could be staffed at the present time by enthusiasts; so we must rule that proposition out and trust to the future to bring us forward by the demand of the public for service in this essential department of our work.

What is the result so far of what I fear you may think very obvious and also very personal reflections?

One of the difficulties in advising the man in practice is that of being up against something. An antagonism, unconscious perhaps, which has grown from the early days when during student-ship disappointment may have followed disappointment, and that ten minutes allowed to examine two or three cases, diagnose and define treatment in the final examination seemed so short; and having defined a treatment, the greatest hope of success may have been due to the number of permanent teeth advised to be removed.

The illustration of cases in journals does not always have the desired result—they may be regarded as fakes and not to be taken seriously, but immediately a student is shown his own capability this attitude of derision vanishes—not so with the practitioner, it is either “I do not treat regulation cases,” or “I remove the teeth and hope for the best.”

A definite requirement of accomplishment is now demanded of every student in the matter of orthodontic work.

This obviously is often regulated to a man's capacity, nevertheless it is essential that he fulfils certain duties. A minimum of four completed cases—two Class 1 or neutroclusion, and two Class 2 or distocclusion; with any type of apparatus suitable. Any cases of Class 3 or mesiocclusion being non-compulsory.

The war caused a hiatus in the number of students available and a sudden drop from thirty-eight to four rendered the department almost inoperative for a time. With normal conditions again a big influx of students and overwhelming material there are now some 250-300 cases under treatment. The method is simple. The children are seen in the examination department, and then passed along to me. They are allotted to the student who requires a case. He then fills one of the cards as shown on the screen with all available history and takes impressions. With the models and patient a diagnosis is made and treatment defined—the apparatus obtained or made as the case may be, and the student carries on with occasional inspection or help as required; remembering that coincident with his starting treatment he is also taking or has taken his lectures. That is a point of great

help. The lectures are almost entirely by lantern slide, diagrams and specimens and are thus practical, interesting and easily understood. Questions are also encouraged, and a feeling of interest and camaraderie engendered.

There is no elimination or picking of cases. All cases are treated as the accommodation occurs. Difficulties are not to be avoided but to be surmounted; and I think you will gather from the slides that we do not fear difficulty. It happens that a student may be unable to complete the case, if needing long treatment, during his time, particularly if taken late in his career; under those circumstances proportionate credit is given him; but to avoid his successor having an easy finish I may complete the necessary attention or hand it to a senior student who is keen.

It is necessary to remember in this connection that the teaching is entirely toward the ideal and the full appreciation of the facial contour shall play an equal part in the correction of the deformity. To many this comes as a surprise. My theory is that if a systematised method has been taught and shown to have satisfactory results the student will hesitate to resort to irregular methods later when thrust on his own resources, and proof of this is constantly arising by the evidence of enthusiasm among the younger, sincere qualified men and the students themselves. It is not an uncommon thing for an earnest student to have as many as eight or twelve cases running at a time.

Now may I for a moment say a word on types which I have definitely laid down for treatment as the result of experience, not that I wish you to discuss this debatable point to-night, but to prove to a student his capabilities and to give him confidence. Under no circumstances are teeth removed to "make room" unless irreparable; particularly so in neutroclusion with high erupting canines; this is my particular fad, for I regard this type as being steadfast, and a due appreciation of the facial contour will convince the most sceptical that of all the teeth the canine is probably the only one correctly placed, owing to its late development. Expansion plays the initial part in general treatment, and I would like to place on record my personal gratitude to Mr. Badcock for his useful device; in fact I am often inclined to remark: "*Expansion! expansion! toujours expansion!*" Distocclusion cases are treated in the generally recognised and orthodox manner.

It is customary to use the appliances of the B.I.Co. for economy in the case of fixed appliances with ordinary expansion arches.

The expansion plate with a slight modification of the one known as the Badcock, *i.e.*, the labial arch is carried behind the last molar rather than as a crib of the first permanent molar. Apart from any debatable point in this I find it removes a technical difficulty in avoiding the damaging of the model in fitting; the average student not being a very skilled mechanic in orthodontic apparatus.

Jackson appliances are occasionally made, but they involve rather more time than a student can always spare.

LINGUAL ARCHES BOTH FIXED AND REMOVABLE.—Angle's Ribbon Arch; in fact an endeavour is made to choose the most suitable appliance; a difficulty often to be overcome is the cost of these more delicate appliances—but many students will purchase their own precious metal rather than be debarred treating the case on suggested lines.

The result of some cases I venture to show you presently with

the help of the screen. The preparation of models I will ask you not to be too critical over, as their correct orthodontic illustration requires much time, and many of these slides were taken hurriedly in the midst of the war under difficult circumstances.

Some modification of instruction has been necessary this year owing to the great amount of work, and there is not the possibility of giving so much individual attention. But I give a demonstration or illustration of the fixing and fitting of all types of appliances to classes of six or eight at a time, and thus they can carry on with very little assistance.

The most satisfactory feature is a keenness and appreciation of both student and patient, and I have had more joy in my teaching work since I have taken this subject than in all the years before. The slacker does not practically exist—the plausible one may be present, but the force of example is generally sufficient to induce him to get along with things, and in the end he will acknowledge his regret at not getting going earlier. The result I hope from this initial training is a body of earnest general practitioners who will endeavour to do the right things, and if beyond their capacity will recognise that fact and ask advice or pass the case along to one more capable.

Time allowed me is short and I should like to run through some slides to show you results obtained. I do not think we can discuss the treatment adopted to-night, but you may gather from these slides that the cases are not like Bill Adams' famous army, but are taken *seriatim*.

These cases are mixed in the sense that some are from my own practice while others are student's work. I will endeavour to remember which, in passing. They are mainly taken, with one or two exceptions, as types which are common, as is obvious to you who have so much experience.

A point I would like to make is that in so extensive a practice as develops in a hospital, diagnosis has to be made quickly and systematically, and while it may be necessary to change the method of one's treatment, it is advisable that care should be exercised in giving a diagnosis and classification.

In doubtful cases of distoclusion due to mutilation or causes which have obviously led a case to change its class, I do not hesitate to classify in its present condition, but may treat on the lines of another classification. In this sense a distoclusion may develop in a case of neutroclusion, due to the crowding of anterior teeth, to treat this as a pure case of distoclusion is to court failure from the start—whereas the correct alignment of the upper anterior teeth will so liberate the mandible that a normal occlusion becomes automatic.

Since writing the foregoing I have had the good fortune to see a great number of radiographs passed through the lantern consecutively.

The conclusion was gradually borne in upon me that most of the troubles which the X-ray is called upon to decide definitely are due to faulty occlusion from many causes, among them being extraction, judicious or otherwise, faulty fillings not fulfilling their requirements, badly articulated crowns, spaces unfilled by prosthetic restoration, all pointing to lack of function with consequent absorption of alveolus, tilting of teeth, elevation, pocketing of gingival margins thus opening the way for pyorrhœa and the eventual loss of teeth, with the probable accompaniment of ill-

health. How much of this might have been prevented if correct occlusion had been established and proper function maintained? For this reason alone, does not the practice of orthodontia justify itself? The alarms raised by some that the prolonged wearing of apparatus is and will be a definite cause of pyorrhœa has yet to be proved. Anything may happen with ill-designed, carelessly applied apparatus, but this does not establish a case against the practice of orthodontia, as so many assume.

I can assure you that it is quite an uncommon thing for any serious condition to arise in connection with the soft tissues with student's practice; the careful explanation of the obvious causes of discomfort due to faulty manipulation assisting the student. I do not wish you to assume that there is any fool-proof system adopted, but the possibility of constant insistence of the necessary caution is very helpful. This is possible from the twofold position occupied, viz., lecturer and orthodontic surgeon.

You will pardon any apparent egotism in these few remarks. It is so difficult to avoid the personal note. My whole desire is to create a wider horizon to show that such important work is largely possible to the man of ordinary intelligence and capacity, and that the stultifying result of the too obvious criticism of things that may happen has a demoralising effect on the advancement of any subject and more particularly on such a one as Orthodontia, in the practice of which evasion of responsibility is regarded as a virtue.

At present the great difficulty of passing on cases for supervision or continuation of treatment is almost insuperable, and thus treatment has often to be delayed or abandoned, particularly where great distances separate the dentist from his patient, and the schools are not very helpful in this respect, though in some the half-term holiday allows a visit. Consequently a course has to be adopted which prolongs the treatment.

Before closing these remarks I must offer my thanks for favours already received and more to come, to Mr. S. H. Roe, who has lately transferred his affections from the prosthetic to the Orthodontic side; we are thus enabled to superintend the whole of a morning's work between us by division of labour. Also the very loyal help of our Dean, Mr. Thompson Madin, whose enthusiasm has enabled me to carry matters this far.

Please remember that like yourselves I am in general practice (unfortunately), and to-day that involves a very steady and arduous occupation, at any rate in the provinces, so that any possibility of indulging in fancy specimens or to preparation of models becomes an impossibility from the mere shortness of time. I thank you for a patient hearing. I may have said some apparently unkind things. They are not meant to be so; they are given with the sincere hope of enlisting sympathy in the work; work which when once established on a sound basis would do much to improve the health and appearance of the young and future generations.

There is as you all know a very great satisfaction in restoring or reducing to a perfect occlusion an unsightly and inefficient denture.

The schools should be unanimous in teaching methods of Orthodontia. A schedule should be drawn up on the evidence of the highest development of Orthodontic knowledge, and the subject should be given its due place in the higher examinations, particularly those for a Degree in Dentistry. School dentists should have a sound working knowledge of Orthodontic principles, and if unable

to undertake treatment should work in collaboration with an Orthodontist wherever a clinic exists.

It is astonishing the amount of work that can be accomplished in systematic routine.

It is quite possible that in large centres, or where schools exist, an independent clinic could be established where practitioners could take a course, and students should be drafted for a definite course of lectures and practical work.

This would save expense and bring the teaching under one definite system. This does not mean that only one type of apparatus should be used or any individual's peculiar ideas dogmatised, but that the shortest possible course should give the student the best knowledge available in the time. The American courses of post-graduate work would not appeal in this country, but the possibility of creating a very useful department of our work is clearly pointed out. It must be remembered that the teaching for any of the licences already embraces the theoretical teaching, and it is the practical application of that knowledge that is wanting.

I should like to see every school working in harmony with a definite syllabus, well considered both theoretically and practically. Would this Society endorse the following suggestions and use its influence so that :—

Every school should appoint a teacher in Orthodontics, with practical teaching a prominent feature.

More serious attention should be given to this subject by the examining bodies.

Every endeavour should be made to foster the practice of Orthodontia and stimulate the profession towards its practice.

I have, I fear, not given you much material for discussion and may have laboured the perfectly obvious, but if by such very obvious truths one can arouse interest and cause this Society to impress on the teaching authorities their responsibility in the matter of Orthodontic training, some useful purpose may have been served by the time spent in listening to a "provincial" member who has had the temerity to address you.

DISCUSSION.

The PRESIDENT was sure all the members felt deeply grateful to Mr. Cale Matthews for coming from Birmingham to deliver his very interesting paper and for showing such a large number of valuable slides. He knew something of Mr. Cale Matthews' work in Birmingham, and could appreciate the enormous amount of energy which he threw into his duties at the University there. The subject of the paper was one on which Mr. Matthews could speak with authority, because he had twenty years' experience in his work and had been a teacher and lecturer at Birmingham University for a number of years. The time was very opportune for a discussion on Orthodontic teaching; there was at the present time a lack of uniformity in the teaching of Orthodontics not only in British dental schools but throughout the world. No definite curriculum had as yet been agreed upon. But while so many matters were passing through a period of reconstruction after the war, it was natural that their Society, being a Society for the study of Orthodontics, should consider how it stood with regard to the teaching of that subject and how it could best be undertaken. He was glad Mr. Cale Matthews had not dwelt unduly on particular methods of treatment and the various appliances that could be used, because at the present time it was more important to consider general principles than details. As he had already mentioned in his Presidential Address, it seemed to him that the teaching of Orthodontics should be considered under two main headings: firstly with regard to the general practitioner

in dentistry, and secondly with regard to the dental surgeon who wished to specialise in Orthodontics. When the question of a curriculum for the orthodontic specialist was considered there were not so many difficulties to be faced as in the case of the general practitioner, because it would be generally agreed that the specialist should have included in his curriculum everything that really pertained to Orthodontics, and the post-graduate course should be framed accordingly. As Mr. Cale Matthews had said, there should be many more specialists in Orthodontia in this country than there were at the present time; and he looked forward to the time when there would be at least one Orthodontic specialist in every big town, and many more in such cities as London, Birmingham, Manchester, etc. When it came to planning a course for the general dental practitioner, however, care must be exercised—as he had pointed out at the last meeting—to see that an already heavily-burdened curriculum was not overloaded. In such circumstances Orthodontics could not be taught as an isolated entity, but must be regarded as an integral part of a complete scheme. There must be a short clinical course, and there should be lectures by specialists in the subject; but for the most part the teaching should be confined to fundamentals, so that when the students came to deal with cases they would be able to collaborate intelligently with the specialist and be able to work with him. Some sort of curriculum might be drawn up, but the main point was to train the students on general lines. Training in Orthodontics need not necessarily be left until the final year; if the curriculum was regarded as a whole, Orthodontic principles could be introduced at quite an early stage. Such subjects as the development of the jaws, the process of dentition, theories of inheritance and acquired characteristics, etc., could be brought in and applied directly or indirectly to the subject of Orthodontics, so that the student would be able to take it up intelligently when he came to give it more specialised study in the latter part of his course.

Dr. SIM WALLACE thought the author was not correct in saying that the paper did not lend itself to discussion. Time would not allow him to deal with all the points in the paper he should like to discuss, but he would like to protest against the phrase “the perniciously ignorant practice of extraction.” Nearly twenty years ago he had been, for a short time, a disciple of Angle, but fortunately he came to the conclusion, by a process of reasoning and by experience, that the only sound method in many cases was to extract certain teeth, generally the bicuspid. Mr. Cale Matthews had indicated his love for the no-extraction theory by saying “*Expansion! expansion! toujours expansion!*” Personally, he had always desired an opportunity of getting a case concerning which he could put down in black and white the result of carrying out Angle’s treatment over a period of three years and getting the teeth into normal occlusion, thereby obtaining an illustration of the merits of “no extraction.” He wished to give some figures in the case of a young adult, with which he was familiar. The face might be taken as typically normal, the measurements, as given by the prosopometer, being auriculo-nasial, 98 mm., from the auricular point to the alveolus, 97 mm., from the same to the tip of the upper incisor 98 mm., and to the tip of the chin 122 mm. Coming next to the prosopometrical measurements of a lady who had been under Angle’s treatment for about three years, the corresponding measurements were 97 mm., 102 mm., 108 mm., and 112 mm. He would like Mr. Cale Matthews to draw two faces to those measurements. He would find the first perfectly normal, but with the other the tips of cutting edge of the incisors are about a centimetre too far forward. Expansion was always forwards; one could not get much room by doing it breadthways. (A Member: “Why not? Certainly you can.”) The reason was because there was only a limited amount of room except in the forward direction; but the chief point was that forwards was the direction of least resistance. In the case with which he was dealing, not only were the front teeth a centimetre too far forward but the chin was a centimetre too far back. Extraction was by no

means an ignorant practice, nor was it pernicious. It was not done through ignorance, because it had been arrived at after studying Angle and various other people who advocated no extraction. He did not doubt that Mr. Cale Matthews would come, in time, to agree with him ; and he thought that gentleman's work had had the best results, to judge from the examples given, where, either by chance or mistake, some teeth had been extracted.

Mr. LACEY said he could not let Dr. Sim Wallace's remarks pass without a very strong protest. Mr. Cale Matthews, in his paper, laid down some fundamental points, which personally he thought should be considered as the basis of all orthodontic teaching : first and foremost, the relation of the arches to the facial contour, a thing which seemed to be very often left out of account, and secondly, the question of expansion. The causation of irregularities was merely a question of the development of the bone, or its non-development, and not a question of the malposition of the individual teeth. If one developed the growth of the bone in any way one obtained normal teeth in normal occlusion in a normal jaw. He felt that those two points could not be over-emphasised. As Mr. Cale Matthews stated later in his paper, radiographs taken later in life showed the most pernicious effect of extraction.

Mr. STEADMAN said he had listened to the paper with very great interest, and had been able to study an advance copy of it beforehand. He must say that he had hoped to find broader views expressed in it, and that the author would have attempted to find out what other schools were doing. From Mr. Cale Matthews' paper one would imagine that Birmingham, and Birmingham alone, was trying to teach Orthodontics, but as a matter of fact there were schools in London which had been teaching the subject for the past twenty-five years. At the Royal Dental Hospital there were men who took advantage of the enormous clinic of that hospital to add to their knowledge of some of the causes of irregularities, and he ventured to think that no school had done more to add to that knowledge than the one attached to the Royal Dental Hospital. At Guy's, too, there was another school which devoted time to the study of Orthodontics, only there they did not take the same narrow views as those held by Mr. Cale Matthews. The London Hospital School of Dental Surgery had a lectureship on orthodontics which had been running ever since the school started, and one of the most distinguished Fellows of the Society was a lecturer there for some years. Mr. Matthews was also incorrect in stating that those schools had no regular syllabus.

He did not follow what the author meant when he wished for " definite practice " to be introduced. In the present state of the subject definite rules could not be laid down, and deformities were so varied in character that he doubted if it could ever be done. At the Royal Dental Hospital they endeavoured to teach the students the broad principles of the subject, and he did not think more could be done in the undergraduate stage. It was one of the chief glories of their profession that its members were always learning, always slowly but steadily advancing in knowledge. It took years to acquire even a passable knowledge of orthodontic work ; and all they could hope to do in the case of students was to teach them the broad principles, and teach them to think and reason for themselves. To speak of extraction as " perniciously ignorant " was a sweeping condemnation of those who differed from the author's views, and one which he thought Mr. Cale Matthews' position in the profession did not justify him in making. In the various dental schools of the country there were men who possessed just as good qualifications as Mr. Matthews who differed from him on the question of extraction, and they were not old men either, but young and active practitioners. It was surely rather presumptuous on the part of any one man to stigmatise their practice as " perniciously ignorant."

With regard to the examples of treatment the author had shown, he said that he never took out a tooth to make room, and never took out a molar to allow a canine to come down. As Dr. Sim Wallace

had pointed out, the pushing forward and expansion which might ensue would cause complete ruination of the facial contour.

At the Royal Dental Hospital, as at some other schools, they were very careful to avoid appliances, when that could be done, by judicious extraction. They endeavoured to hold broad views, however, and occasionally, in suitable cases, would use fixed appliances.

With regard to making Orthodontics a speciality, he confessed he doubted whether such a step would be wise. As had been said at the last meeting, specialists tended to hold narrow views, and a small band of enthusiastic men might arise whose sole aim would be perfect articulation, regardless of anything else—regardless of facial contour, general health, and so on. That would do a great deal of harm.

Mr. MAYER said he had appreciated and enjoyed Mr. Cale Matthews' paper. Whatever other gentlemen might think of the author's methods of treatment, he personally must say that Mr. Matthews had satisfied him on every count.

Mr. PITTS thought Mr. Cale Matthews' paper rather lent itself to criticism, because the author, somewhat injudiciously, mixed up details of treatment of a contentious character with the broader question of the teaching of Orthodontics. Many teachers held the view that orthodontic teaching should have its place in the curriculum of students, so that they might have some idea of the underlying principles and, what was equally important, some idea of how the various appliances should be used. Whatever views were held on the question of extraction, there were certain appliances which had to be used at some time or another. Mr. Matthews seemed to have solved the problem of orthodontic education for students at Birmingham, and on that he congratulated him heartily. It was a matter for congratulation, and a reproach to other schools, which he feared lagged behind. It was a difficult problem, because certain lines of teaching were laid down for the schools which had to be followed; the schools had to spend a certain number of hours teaching certain subjects and, when the students' time was so overloaded, it was difficult to find room for anything else. Mr. Matthews had shown that it was possible, however, given keenness and enthusiasm, and he seemed to have fired his students with his own keenness. The subject was of the utmost importance, and he hoped what Mr. Matthews had said would be widely read and pondered.

There were two small points in the paper on which he wished to comment. Several speakers had referred to the phrase which Mr. Cale Matthews used with regard to extraction. He was perfectly entitled to condemn the practice of extraction as pernicious and ignorant if he wished, but he (Mr. Pitts) wished to enter a mild protest against the employment of such terms. There were some who thought extraction was a legitimate part of Orthodontics, and they were entitled to their view.

In the excellent syllabus of lectures which the author had given he would like to suggest the addition of a subsection on the influence of heredity on irregularities. That was an important subject, because the question might easily arise whether in those cases it was worth while, or wise, to interfere with a condition that was so intimate a part of the possessor's personality.

Mr. J. B. BULL said the method adopted by Mr. Cale Matthews for teaching students was in many respects similar to that in vogue at Guy's at the present time. He gathered, however, that Mr. Matthews spread his teaching over three or four years of the students' course. Personally he preferred the method recently adopted at his own hospital, by which the student was given three months intensive training in Orthodontics towards the end of his fourth year. That entailed the disadvantage that a man was not able to follow his cases from start to finish, but he did see and treat cases in every stage of development during that time, and in his fourth year a student was in a much better position to benefit by practice and teaching than at an earlier stage. He thought it was imperative that, before starting the study of Orthodontics, the student should be thoroughly acquainted with, and have

had as much experience as possible in, the other branches of dental surgery, and *that* knowledge and experience was not acquired until about the middle of his fourth year. The time available being so short, it followed that as much time as possible should be spent with the patients, and not away from them, and therefore all apparatus of a movable type should be constructed not by the student himself, but by first and second year students. In that way the dresser employed on orthodontic work would gain his experience in the construction of apparatus during his first two years, and would be able to devote more time to the other branches of the subject during the latter part of his course.

He did not want to enter into a discussion on treatment by extraction, but thought that whatever views one held on the subject, it should be agreed that the "judicious extraction" method should be taught. As long as the world lasted treatment by extraction would be practised, and unless the students were instructed on that subject, when they came to practice they would be unable to discriminate between extraction which might be termed necessary and that which was unnecessary. They all wished to aim at the ideal, but in so very many cases had to come down to the practical!

The author had inquired why there were not fifty or more orthodontists practising in London at the present time. If by "specialists" Mr. Matthews meant men who confined themselves exclusively to the practice of orthodontics, he thought if there were anything like the number suggested a great many of them would be joining the unemployed processions which were becoming such a familiar feature everywhere!

The SECRETARY read the following from Mr. Sheldon Friel, of Dublin, who was unable to attend the meeting:—

"I am very sorry that it is impossible for me to hear Mr. Cale Matthews' paper on Orthodontic Education, and I hope he will understand that any criticism I offer on his paper is meant to be constructive, and not destructive criticism. Mr. Matthews' statements as to the apathy of the dental profession towards orthodontics are only too true. This was also emphasised by Mr. McKeag at the last meeting. It seems to me that this attitude must continue, owing to the huge field necessarily covered in the dental curriculum. The subject of dentistry exclusive of Orthodontics, is so vast that few men can possibly obtain a full knowledge of all its branches, and this takes no account of the research work that is crying out to be done in order to prevent dental diseases. If, in addition, it is expected that the average dentist should be an Orthodontist, it means that general dentistry will be sacrificed to Orthodontics, or vice versa.

"I do not think that Orthodontics should be left out of the curriculum of the dental student, but rather the curriculum should be radically altered. I feel that the student should be taught the principles on which Orthodontics are based, and that actual treatment should occupy a very secondary place. Mr. Matthews rightly says that a printed syllabus of lectures conveys very little, but nevertheless I think it shows the general trend of the lectures. The following syllabus, which is almost identical with that of Mr. McKeag's in Queen's University, Belfast, is divided into twelve lectures, only three of which are devoted to treatment:—

SYLLABUS.

Definition of Orthodontics.

Occlusion	{ Hypothetical occlusion.
	{ Typical occlusion.
	{ Individual occlusion.

Mechanical forces controlling occlusion.

Malocclusion	{ The distinction between malocclusion and individual occlusion.
	{ Classification of malocclusion (i) Angles, (ii) B.S.S.O.

Aetiology and	{ Local causes.
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Prevention of	{
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Malocclusion	{ General causes	{ Constitutional diseases.
		{ Food that requires no chewing.
		{ Deficiency of vitamins.
		{ Deficiency of the essentials of foods.

Diagnosis of malocclusion.

Tissue changes incident and subsequent to tooth movement.

Treatment :—

- (i) Removal of cause alone.
- (ii) Removal of cause and exercises, etc., for the development of the forces of occlusion.
- (iii) Removal of cause and mechanical correction of the teeth.
- (iv) Extraction of teeth with or without further mechanical correction.

Prophylaxis during treatment.

Demonstrations :—

- (i) Impression and model technique.
- (ii) The construction of appliances

{	Fixed.
{	Removable.

“ I think that the object in view in teaching students should be to make them capable of recognising malocclusion in its incipient stages, and that they should be capable of undertaking preventive measures, as, for example, in the prevention of mouth-breathing, improper feeding, habits, premature extraction of deciduous teeth, and finally that they should have a base-work on which they could build, if they intend at a later date to take up treatment. The way to meet the public demand for the treatment of malocclusion would be to found a post-graduate school for orthodontic specialists. Mr. Matthews says : ‘ The difficulty of obtaining teachers must for some time be considerable—no one should be allowed to take full responsibility in this work whose only credentials are theoretical—a wide experience of actual practice should be a *sine qua non*.’ Would it not be possible, in addition to certain teachers in this country who have a sound theoretical knowledge, to bring over an American orthodontist, who unites theoretical knowledge with a technique of very high standard. Such a school, with a course extending over eight or nine weeks, would turn out a number of orthodontists to carry out the teaching in future schools.

“ I presume that Mr. Matthews did not include Ireland when he said that there were no specialists in the 40,000,000 population, as there are two in Ireland. I think the Society is greatly indebted to Mr. Cale Matthews for his paper on this all important subject.”

Mr. CALE MATTHEWS, in replying to the discussion, said that, while it might sound curiously contradictory, he felt very happy in having aroused a certain amount of antagonism. He thought anyone who initiated a discussion on a subject similar to the one which he had raised was bound to meet with antagonism, but that antagonism was healthy and beneficial in its effect.

He was sure none of those present would wish to convict him of disloyalty to his profession or to the staff of any other school, or of accusing anyone of dereliction of duty in teaching or work. Orthodontia to-day was largely a matter of opinion, backed up by certain facts derived from work already accomplished. He regarded the criticism his paper had met with that evening as a great compliment ; he had a very sincere objection to anything in the nature of a Mutual Admiration Society ; and when a man like Dr. Sim Wallace took the trouble to speak and criticise his work he thought it was a very great compliment. He did not think, however, that Dr. Sim Wallace realised that his criticism was one of the greatest compliments, in a backward way, that he could have given the paper. If he understood aright, Dr. Sim Wallace’s life work was to prove the great value of function, and one of the most important things a student could be taught was to establish function. Mr. Steadman had pulled his remarks to pieces, and he was quite justified in doing so, because he had to admit that the paper had the unfortunate aspect of appearing to criticise other schools. To come down to actual facts, however, what had been the results of the teaching of Orthodontia in the schools for the past ten or twenty years ? Those of the members who had been qualified for some time would know how little of value the final examinations for any of the diplomas had been with regard to Orthodontics. It was

not the syllabus drafted by the staff, but the individual interpretation of that and the actual work in the schools which counted. Anything might be put down on paper, but if the students did not do the work they would reap small benefit from that. He knew that all the schools had a syllabus, and all—on paper—worked on more or less similar lines, and everyone hoped that in time a definite teaching system would be established such as existed in other branches of dental work. An analogy might be found in the controversy that was exercising the dental profession throughout the world at the present time, with regard to sepsis and the treatment of root fillings. No controversy in Orthodontia was so acute as that. He hoped the members would absolve him from any intention of criticising individuals when he criticised the work of the schools. A question had been asked with reference to his use of the term "mutilation," but he understood that was a recognised term in Orthodontia for cases in which teeth had been lost before treatment was started. He had been very interested in what Mr. Bull had said as to the method of teaching at Guy's, and would be glad of an opportunity of discussing it with him, but he was inclined to think that three months was a very short time for a student to pick up any practical ideas of Orthodontic work.

He wished to emphasise what was really one of the main points of his paper, but which seemed to have been overlooked, namely, that in the restoration of function one must have due regard to facial contour. The unfortunate case Dr. Sim Wallace had referred to might have been treated by Angle's methods, but he did not think that Angle would have obtained the result described. He had never had the privilege of seeing any patients who had been treated by Angle, but disfigurement was against all the ideals of orthodontic treatment, which were to beautify and restore perfect function.

He greatly appreciated the President's remarks. As he had already mentioned, his only desire in reading the paper was to arouse interest in what, to his mind, was a very absorbing subject, and to see whether it would not be possible to equip young practitioners with some real knowledge of what was meant by Orthodontia.

With regard to the "pernicious system of extraction," such a term did not apply to an audience such as the one he was addressing, but it must be remembered that the great bulk of the profession was practising in the country, rarely attended meetings or discussions or met their fellows, and in consequence were extracting teeth in an indiscriminate, injudicious and pernicious manner.

He must repeat that the whole question rested on a study of beauty. Anyone who walked along the streets noticing the passers-by must realise that the main cause of ill-looks was the lack of development of the mandible and ill-proportion of the mouth. As soon as proper function was restored the whole of the troubles treated by Orthodontia would be improved, as would also the general health of the patient.

In conclusion he thanked the members for their criticism and those who had appreciated the few remarks for what they had said, and begged those who occupied teaching positions not to take any of his observations as being personal.

The PRESIDENT said it only remained for him, in the name of all present, to thank Mr. Maxwell Stephens for his Casual Communication, Mr. Cale-Matthews for his paper, and also all those gentlemen who had taken part in the discussion, and announced that the next meeting would be held on Wednesday, March 9th.

AN Ordinary Meeting was held at 11, Chandos Street, Cavendish Square, W., on March 9th. The President (Mr. J. LEWIN PAYNE) was in the chair.

Professor Arthur Keith, F.R.S., of the Royal College of Surgeons, was elected an Honorary Member of the Society.

Messrs. Ernest B. Dowsett, H. Llywelyn James, F. Lawrence, H. L. Messenger, George B. Pritchard and J. J. du Toit were elected Members of the Society.

The following paper was given by Mr. Northcroft:—

THE BEST AGE FOR TREATMENT IN RELATIONSHIP TO RETENTION.*

By GEORGE NORTHCROFT, L.D.S.

It may be remembered that Gobind, the one-eyed, told Kipling that "when man has come to the turnstiles of Night all the creeds in the world seem to him wonderfully alike and colourless," and, I confess, there are models in my collection that seem to prove and disprove any dogma.

Recently we have been told that this Society narrow-mindedly confines itself to questions of treatment which remain unanswered, and which merely end in futile and unproductive discussion; that we lack guiding principles except of the most elementary kind. One would have thought that listening to such authorities as Keith, Mellanby, or J. F. Colyer, showed our hunger for establishing fixed principles on the broadest lines, that this is that road to successful treatment which all of us are striving to find, and to the vast majority it is the attainment of this goal by ourselves, for the public weal, that leads to a participation in the profession at all. After seeing the display of many interesting treated cases one came away with the impression that one principle had been forgotten that we thought had been established years ago, and should now be taught to, and known by, the profession at large—that is, the necessity of commencing treatment at an age so young that gross irregularities have not become established; at an age when growth is more certain of taking place, and probably only needs the right stimulus, whether mechanical or physiological, or both, to produce normal results. It is the apparent necessity of repeating this oft-told tale that has caused, in all too short a time, the preparation of this paper, and when leisure is obtained to go more thoroughly through models, now numbering some two thousand, it is hoped that some statistical results may be produced of lasting value.

J. E. Spiller, in March, 1913, answering the question, "at what age to commence treatment of post-normal cases," with characteristic modesty said "he did not know," but gave many cogent reasons for selecting *eight* as the ideal age. The same age would seem to apply to neutroclulsion, possibly a little later, eruption is such an uncertain factor. Prenormal cases, if anything, should be taken earlier. What should be insisted on is the principle of early treatment, and from observation of a series of models of the same mouth taken over successive periods, it can be proved that when once an abnormal condition exists, that condition becomes progressively worse up to the maximum at which stable equilibrium is established

* Read before the British Society for the Study of Orthodontics, Mar. 9, 1921.

between all the forces of development, non-development, muscle pressure, air pressure, etc., and therefore, as far as practical, treatment should commence when abnormal conditions are at their minimum.

Now we do not always learn the most useful lessons from treated cases, but sometimes from those cases that might have been treated, and can then study at what age simple cases become complicated. For many years the writer has advocated securing models of all the children in one's practice so as to visualise how far nature is helping the developing jaws and when, and how much, outside aid must be sought. This implies that every dental surgeon should be an orthodontist, and that this aid to diagnosis which the specialists could obtain rarely otherwise, would release him from having extremely complicated cases to treat at all, if only mouths were looked after and cases treated in time.



The vexed question of retention was dealt with in a paper read at the International Dental Congress of 1914, but other vexed questions have loomed larger since then, so that it might be prudent to recapitulate the conclusions then reached. The time factor varies from no time at all in "natural retention" to four years, and even permanent retention. No data are available to guide us as to how long any particular type of case should be retained. Cases commenced at eight years should certainly be watched till ten or even later, especially when there is lack of development in the canine region.

There has been no time to make lantern slides for the purpose

of this paper, but I would impress on the Society the necessity of having all communications lavishly illustrated, as it thereby renders such communications so much more interesting and intelligible.

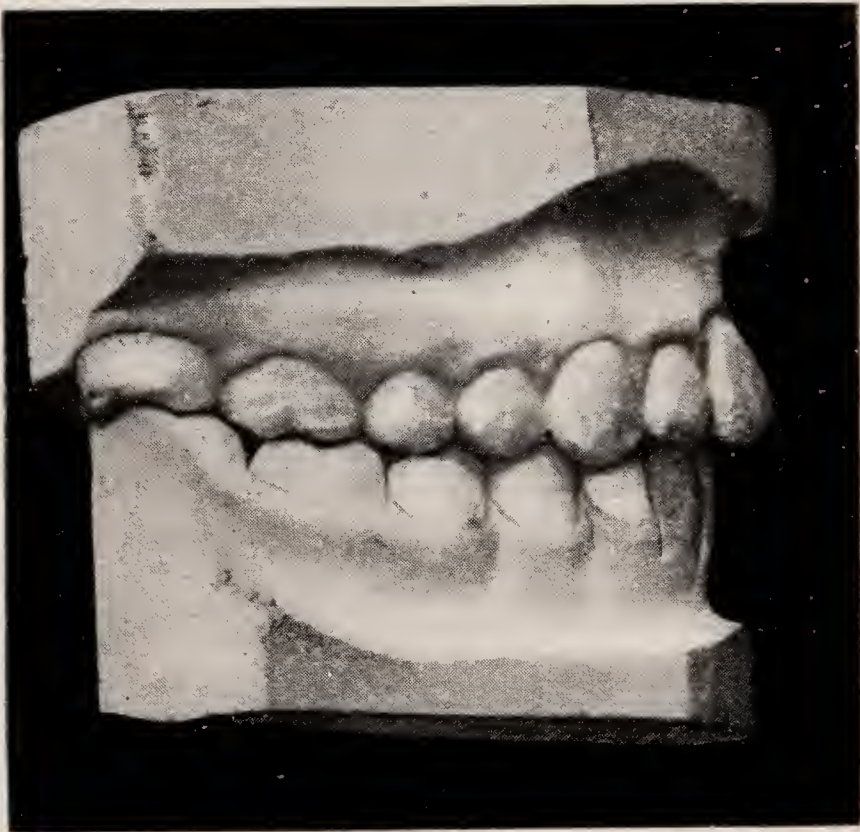
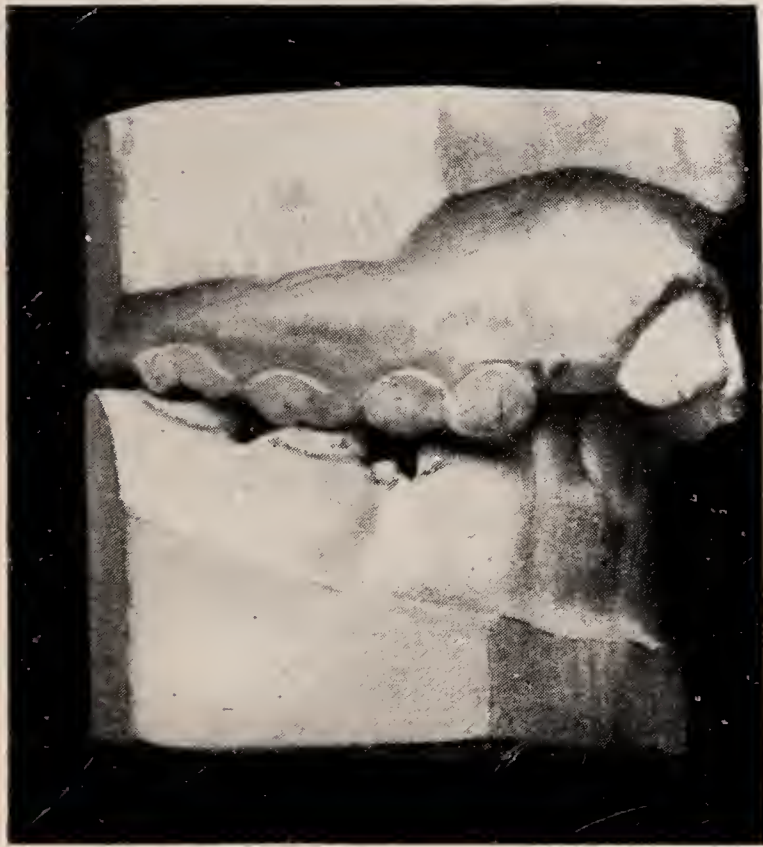
1. Case 86. Female 6 yrs. Normal Antero-Posteriorly, but apparently no spacing taking place, therefore, according to Bogue, should be expanded. Marked "to be watched."

86c. 15.0. 86a and 86b showed that no treatment would be necessary.

Shall we say perfect occlusion? Nature has done everything necessary. Note "small teeth in large jaws." Very late eruption of $\frac{7}{7}$ | . | $\frac{7}{7}$ not yet in occlusion. Foreshadowed imbrication of $\overline{2}$ in Model 86a entirely disappeared. Palatal measurements:

c | c	20.7	3 | 3	23.	The average natural increase in palatal dimensions is nearly 2 mm.
d | d	24	4 | 4	25.4	
e | e	27.5	5 | 5	29.7	

This shows the wisdom of waiting till 8 years old to see if development is normal according to type.



2. Case 299. Female 7.3 yrs. Bottle fed. Partly mouth breather, no adenoids. Mother post-normal.

Double post-normal \overline{edc} | $\frac{e}{e}$ septic and removed.

299b 7.6. I.M.T. applied.

8.3. Elastics only worn at night. Lower lingual arch.

9.10. Apparatus removed.

299j.

14.0.

Occlusion normal. Note $\overline{5}$.

This case shows the result of treatment commenced at an ideal age, retained by decreasing mechanical force over a considerable period of time—two years and four months.

3. Case 303. Female 5 yrs. Adenoids removed at this age. Note post-normal occlusion on right side, slight proclination of maxillary incisors, with lower centre, half a tooth to the right. Does this mean a congenital defect, moulding during birth, finger-sucking? Normal growth presumably taking place judging by spaced incisors, no earlier models available to check this observation.



303b.

6.6.

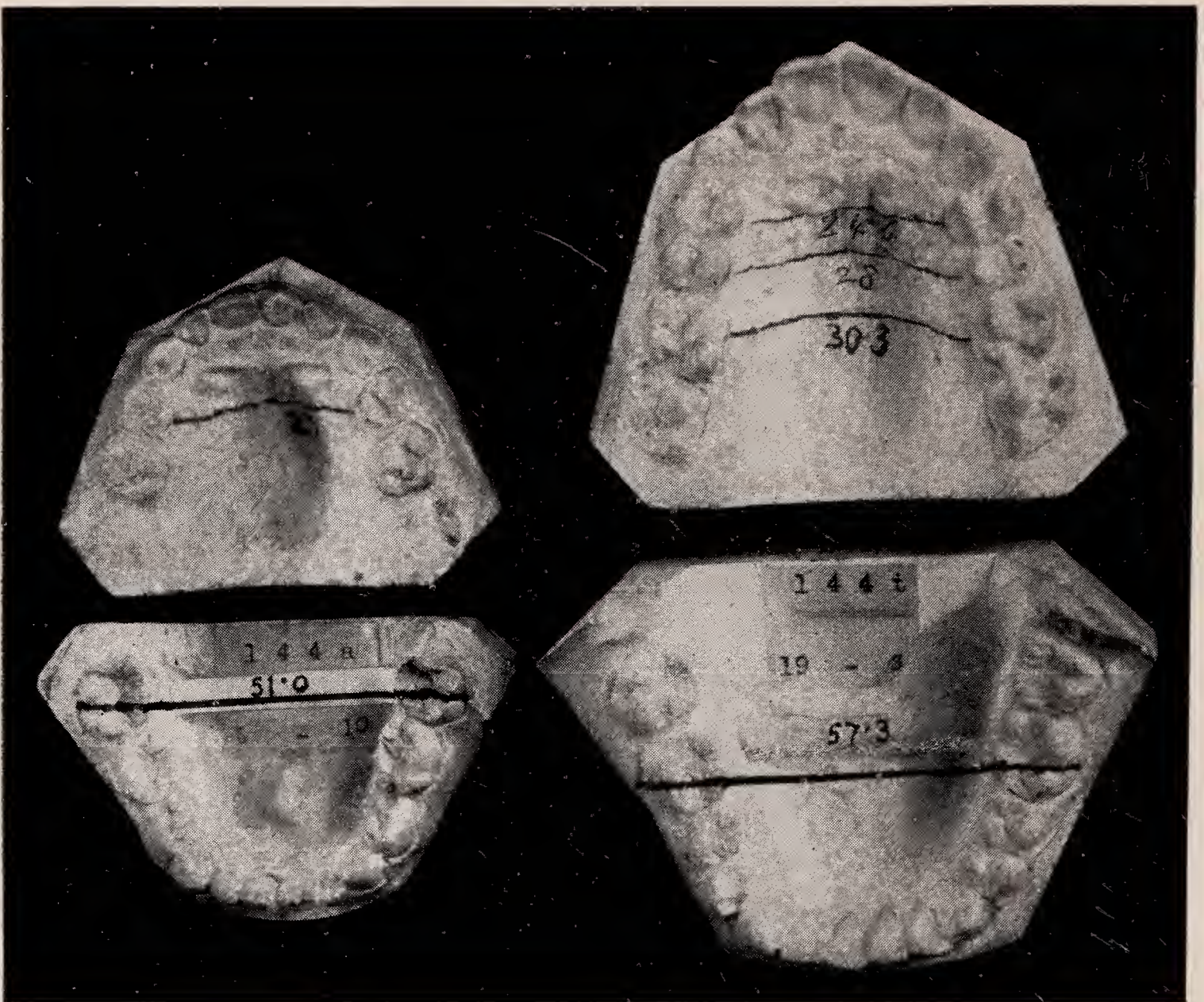
There is an interesting attempt by Nature to correct prenatal condition of $\overline{6}$ | by forward thrust of $\overline{6}$ |, \overline{c} | having been pushed out of the arch. *But* note the impacted condition of $\overline{6}$ | $\overline{6}$ actually causing absorption of \overline{e} | \overline{e} , denoting faulty development of maxilla and its sinuses. It is in these cases that tilting back the $\overline{6}$ | $\overline{6}$ by intermaxillary traction would probably prove successful, the cases successfully treated by this method have not been seen at this age, and therefore the method has been advocated for treating all so-called post-normal conditions.

- 303c. 7.10. Centre nearly normal. Nature has at this age produced her maximum effort at correction, and unaided will be seen to fail in the fight for symmetry and beauty.
- 303d. 8.1. Even in three months the centrals have inclined further forward space forming for $\underline{2} \mid \underline{2}$.
- 303e. Was sent away to another practitioner with suggestions for treatment.
- 303f. 11.1. Three years later. Note peg-shaped $\underline{2} \mid$ rotated $\mid \underline{2}$ and $\underline{e} \mid \underline{e}$ have been forced out, not extracted, it is therefore a case of "self-mutilation." $\underline{5} \mid$ has been pinched out on right side, but is present, probably in palate, and $\mid \underline{3}$, according to X-ray, is erupting in palate. Note rotated $\underline{3} \mid$. Pre-normality much worse.



- 303g. 12.10. $\frac{7}{7} \mid \frac{7}{7}$ erupted, fully developed prenormal $\underline{6} \mid \underline{6}$.
 $\mid \underline{3}$ still unerupted, $\underline{5} \mid$ in palate and $\mid \underline{2}$ rotated. This condition could have been easily corrected at 8 years old, and should never have been allowed to become progressively worse.

Case 144. Female 5.4. Mouth breather. Reported no adenoids.
 144a. 5.10. Note early eruption of $\overline{1} \mid \overline{1}$.
 Started expansion at 6.9. $\overline{21} \mid \overline{12}$ a
 straight line owing to lip pressure.
 144f. 7.1. Apparent maximum expansion obtained
 in 4 months.
 Retention plate inserted.



144k. 7.11. Slight collapse noted. Upper and lower
 expansion plates again worn, and retention
 continued with changing plates as various
 temporary teeth were lost.
 Retention was prolonged until 11.0 as
 mouth-breathing persisted; but at this
 time it was supposed normal bone growth
 had taken place.

144r.

12.6.

An interesting, and it is believed an original, observation now comes into play. The bucco-lingual diameter of $\overline{d} \mid$ and $\mid \overline{d}$ is 8 mm.

The bucco-lingual diameter of $\overline{4} \mid$ and $\mid \overline{4}$ is 10 mm.

$$144k. = \frac{8}{29} \frac{8}{10} = 45$$

$$144r. = \frac{10}{25} \frac{10}{10} = 45$$

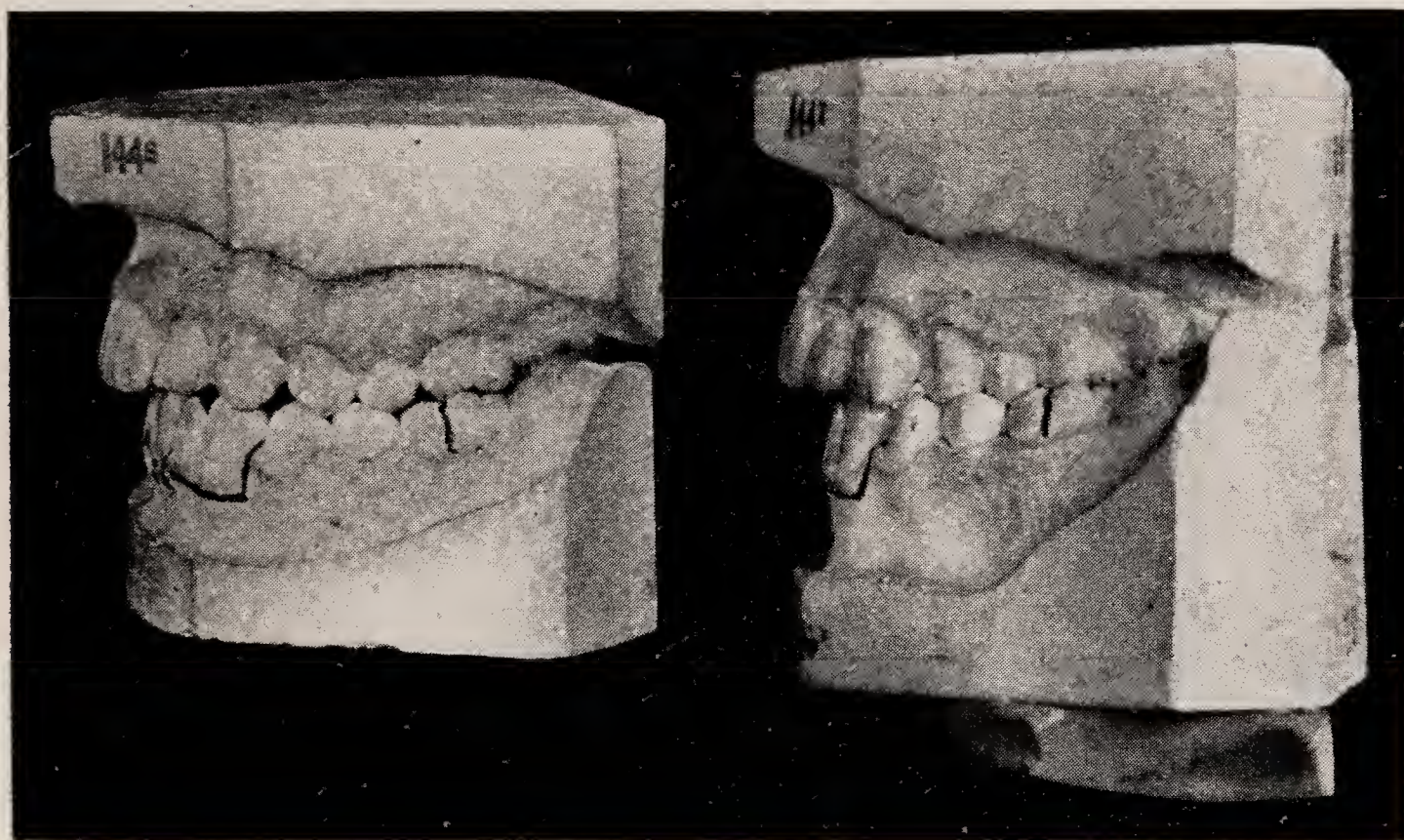
From the palate measurements it looks as if the expansion has collapsed; in actual fact outside measurement shows that buccal pressure has not resulted in collapse.

All this time the mandible has been steadily growing, and what looks like a maxillary relapse is in reality a continued buccal growth of mandible up to 19.3.

144s.

13.7.

The greatest buccal widths at $\overline{c} \mid \overline{c}$ and $\overline{6} \mid \overline{6}$ for 144a are 28 mm. 51 mm.



144t.

19.3.

144k are 31 mm. 53.7 mm.

144r „ 32 mm. 55.5 mm.

144s „ 32.4 mm. 56.4 mm.

144t „ 33.3 mm. 57.3 mm.

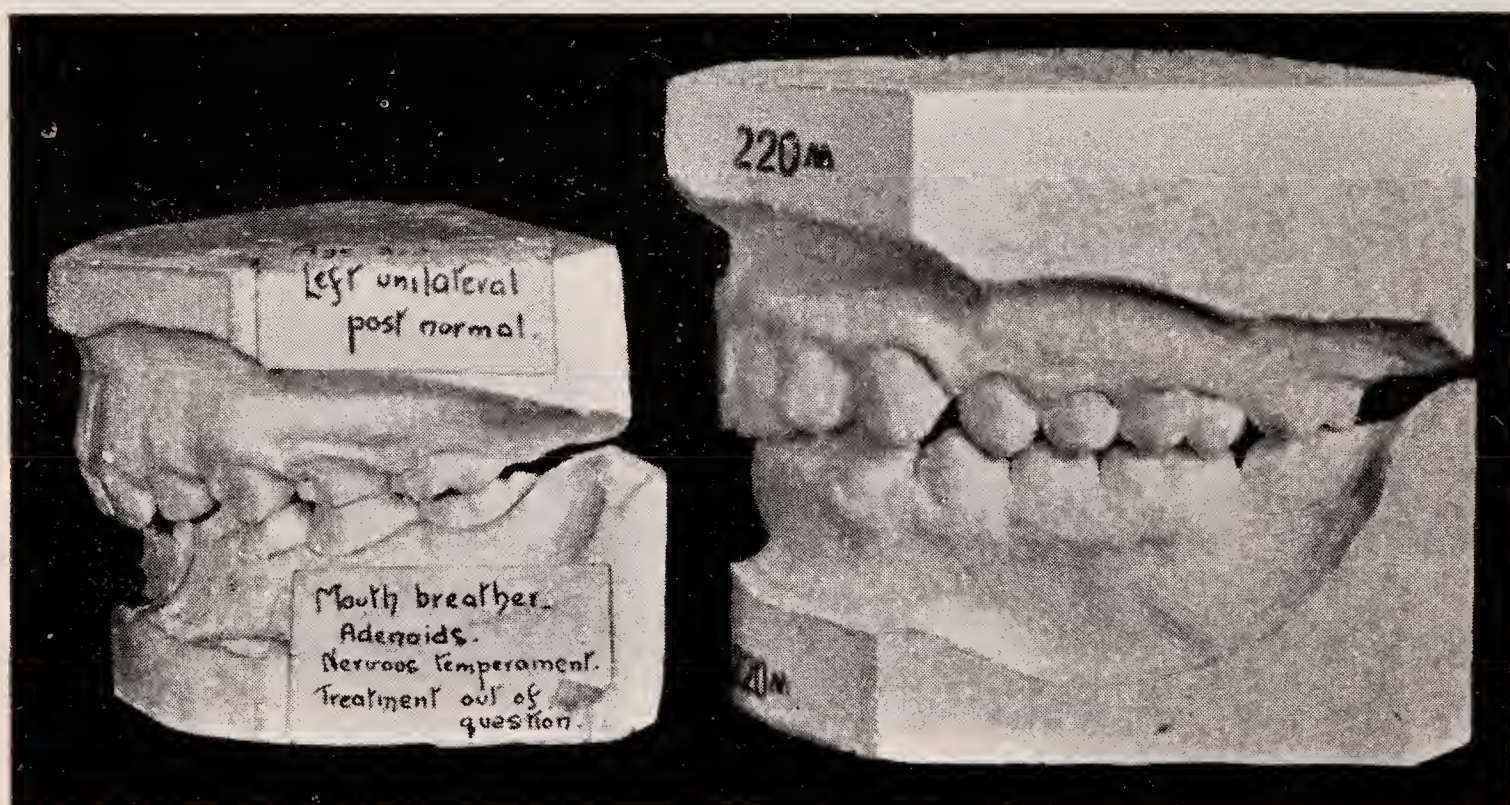
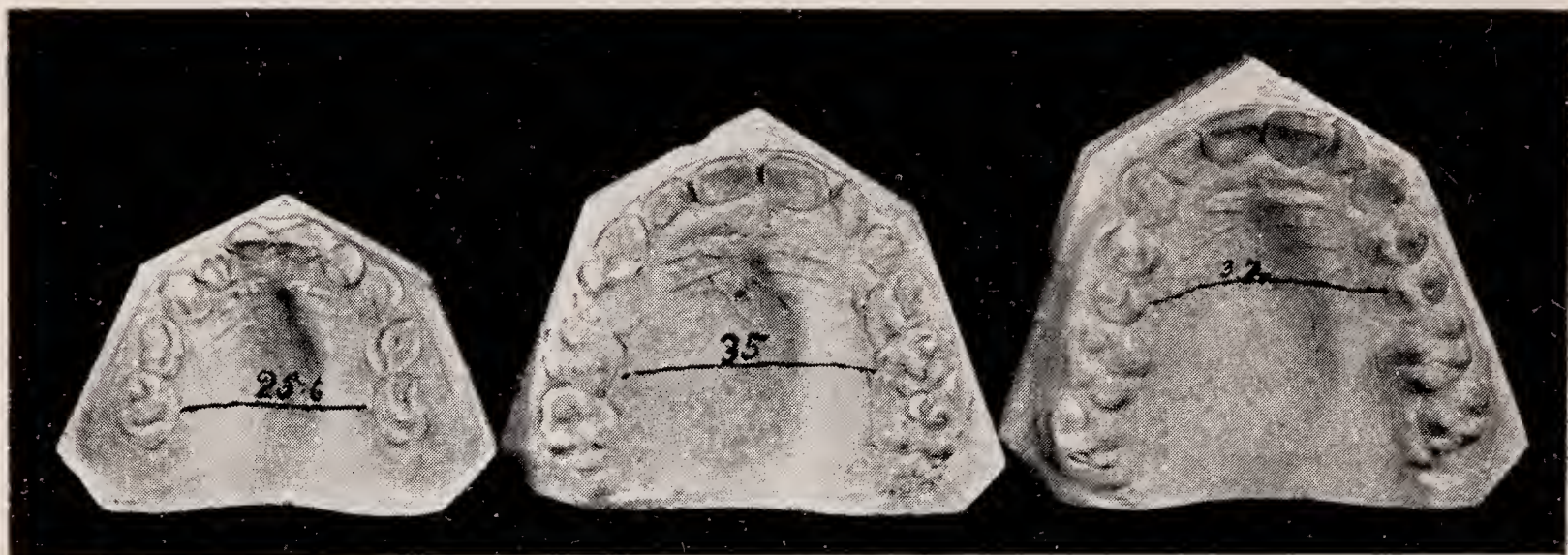
Total growth of maxilla at $\overline{4} \mid \overline{4}$ is 6 mm.

Total growth of mandible at $\overline{3} \mid \overline{3}$ is 5.3 mm. and at $\overline{6} \mid \overline{6}$ is 6.3 mm.

Probably stable equilibrium is now established.

One can, of course, only picture what this mouth might have been like if no treatment had been undertaken.

5. Case 220. Male 3.3. Adenoids. Warned parents.
 220b. 5.11. 6.1. Lower $\overline{1} \mid \overline{1}$ erupting distally.
 Adenoids removed.
 220d. 6.11. Double post-normal. Imbrecated lower incisors.
 220f. 7.10. $\overline{1} \mid \overline{1}$ rotated. Lower $2\overline{1} \mid \overline{1}2$ worse.
 Treatment advised.
 220j. 7.11. Expansion plate inserted.
 9.6. Expansion obtained 9.4 mm. Post-normal.
 Cured.
 220k. 9.11. Plate abandoned 9.9, collapse commencing
 it was recognised that the case had been
 over-expanded, and this was expected.
 220l. 13.4. Expansion collapsed 3 mm. Total ex-
 pansion retained 6.4 mm.



- 22cm. 15.3. Treated on exactly the same lines as previous case, but in the former adenoids were not removed and mouth breathing persisted, and unless equilibrium is established nothing but permanent retention would avail.
6. Case 258a. 2.8. Prenormal. Whether congenital or acquired is doubtful. $\begin{array}{|c} a \end{array}$ erupted first. Palatal width $\begin{array}{|c} d \end{array} \begin{array}{|c} d \end{array}$ 24.5 mm. Treated 2.11 to 3.3. Natural retention.
- 258f. 12.6. Bite normal. Natural expansion 2.5 mm. Width between $\begin{array}{|c} 4 \end{array} \begin{array}{|c} 4 \end{array}$ 27 mm. Very early treatment was certainly successful.



7. Case 191. Male. Untreated case. Shown in contrast to previous one.
- 191b. 2.7 Crowded incisors. Supplemental $\begin{array}{|c} c \end{array}$. Needs expansion later. Mouth breather. Reported no adenoids. $\begin{array}{|c} e \end{array} \begin{array}{|c} e \end{array}$ unerupted at this age.
- 191g. 5.4. Supplemental $\begin{array}{|c} c \end{array}$ removed at 3. $\overline{ba} \begin{array}{|c} ab \end{array}$ more crowded.
- 191j. 7.4. Hypoplasia and retarded eruption $\frac{6 \begin{array}{|c} 6 \end{array}}{6 \begin{array}{|c} 6 \end{array}}$. Palatal width between $\begin{array}{|c} d \end{array} \begin{array}{|c} d \end{array}$ 25.5 mm.
- 191l. 14.7. Note collapse of upper arch 2 mm. at $\begin{array}{|c} 4 \end{array} \begin{array}{|c} 4 \end{array}$. Adenoids removed at eleven years, too late to effect development of maxilla. Complications gradually increasing.

X-ray shows $\overline{5}$ | missing, | $\overline{5}$ pinched out of arch by forward movement of $\overline{6}$. Supplemental $\underline{3}$ with $\underline{3}$ buried in palate.

Female. The bucco-lingual diameter of \underline{d} | and | \underline{d} is 9 mm.

The bucco-lingual diameter of $\underline{4}$ | and | $\underline{4}$ is 9.4 mm.

$$191j = \frac{9 \quad 25.5 \quad 9}{9} = 43.5$$

$$191l = \frac{9.4 \quad 23.5 \quad 9.4}{9.4} = 42.3$$

Showing 1.2 mm. natural contraction between 11.0 years, when adenoids were removed, and 14.0.



It is hoped that the analysis of the seven cases shown to-night. the simplicity of the treatment involved and the not unsuccessful results of that treatment, will help to establish the principle that treatment should be begun about the age of eight, and that retention should be continued until a reasonable time has elapsed for bone to grow and muscle stresses to become balanced. That if a relapse of expansion does take place it will leave the case, at any rate, much better than if no treatment had been attempted. Leaving cases till a later age can but make the treatment harder, more painful, more prolonged, and a successful result more doubtful.

HAROLD CHAPMAN, L.D.S.Eng., D.D.S.Penn.:

You will remember that at our last meeting one member proposed that the discussion of Mr. Cale-Matthews' paper be continued at this meeting, and it seemed a desirable course in view of the interest it aroused. It will also be remembered that several who took part in the discussion of the paper were reminded that they were speaking away from the subject indicated in the title of the paper. I personally sympathised with those members, as the latter part of the communication tempted one to digress. This evening, Mr. Northcroft's paper has widened out the scope for discussion, and we must all feel grateful to him for the opportunity he has afforded us of continuing part of the discussion of the February meeting, as well as for his most excellent paper, which is of such practical value and is based on his experience.

The title of Mr. Northcroft's paper is such that it made an impression on me; I wondered what was the significance of the last four words: "in relationship to retention." Why was the essayist not content to discuss the best age for treatment? Undoubtedly he wished to emphasise the importance of retention, for it can be of little value to move teeth if they cannot be retained—we know quite well that teeth can be moved at any age, but up to what age they can be moved and will stay in their new positions, after a definite period of retention—without (artificial) permanent retention—is unknown, as far as I am aware.

The writer of the paper has shown us actual cases to prove that eight years is a good age for treatment and we must agree that he has succeeded. Yet on theoretical grounds I think a much earlier age might well be chosen, and on practical grounds I believe that treatment should be undertaken earlier than has been advocated; in fact I would say that any abnormality should be corrected as soon as it arises—that is theoretically: and practically that its correction should be undertaken as soon as it is possible to treat the patient. You will say that such statements should be supported.

The experiments of Baker, of Boston, are known to you all; he took two young rabbits from the same litter; the molar series on one side of one rabbit he rendered functionless by grinding the teeth so that they did not occlude; this rabbit compulsorily masticated on the other side only. The second rabbit was kept as a control. The entire skull of the latter developed fully and symmetrically, but the skull of the former developed fully on the functional side, but was much under-developed on the non-functional side; comparison between the size of the zygoma and its distance from the body of the skull on the two sides may be taken as an indication of this. This is a marked and clear example of lack of function being followed by lack of development. The teeth on the one side were not used; in fact they were of no use; in consequence the muscles of mastication were not used and so the bones to which they were attached did not develop to the extent that they did on the functional side. I should mention that these rabbits were killed when a few weeks old.

I have no doubt all this seems to be rather away from the point, but now let me connect these experiments with a supposed case of irregular teeth in a patient—a case of odonto-prosopic orthopædics.

The simplest one I can suggest is a typical case of Angle's Class I or neutroclusion. Such a case is an example of lack of development in every direction—laterally, antero-posteriorly and vertically; in other words the jaw bones are a miniature of what they ought to be.

We look at models of such a case; what is suggested to our minds? irregular teeth—that is the most vivid impression we receive. We are apt to forget that irregular teeth are in ninety-nine cases out of hundred but the visible expression of a mal-development of bone, just as the lateral curve in a femur or a bow leg is an expression of a similar mal-development. In the one the bone mal-formation is patent to all, the result of wrong stresses on the bone; in the other we must look at the deformity through the teeth and endeavour to visualise what the shape of the bone is and what it would have been had development been normal. In the supposed Class I case the stress was normal in direction but abnormal (insufficient) in degree. Now from Dr. Baker's experiment, it is fair to assume that not only the bones containing the teeth are mal-developed, but also *all* the bones of the skull. Take one bone, the mandible: this is too narrow, too short, and has not enough height; the condyles are too close to one another, they are too close to the central incisors and to the mental process; the inferior borders approximate one another too much, and the vertical height of the bone is insufficient. The same applies to most of the bones of the skull—certainly to half of them if we are to place any value on the experiments I have referred to. Of course there are varying degrees of such mal-development and fortunately they are seldom as severe as the example referred to.

Now we proceed to treat this case of Class I; we enlarge the arch of teeth laterally and antero-posteriorly so that all the teeth may fall into good alignment; we are all agreed there is no difficulty about this, we have been shown examples of such to-night, and at the last meeting, whose ages varied from say 5 to 15 years. Having got the teeth in alignment we must again endeavour to look through them and behold the bone structures beneath. We can only assume what we should see. Suppose the abnormal bone growth to have been incited (or should I say the bone growth to have been inhibited) at 2 or 3 years of age and continued up till 8 years, when treatment is undertaken. The teeth are put in alignment as nature intended, but are the condyles widened to correspond, are the inferior borders widened to correspond? the distance of the condyle to the central incisors is perhaps nearer to normal, but how about the distance from the condyle to the mental process? Say the treatment takes 6 months or a year; in that time has the lack of growth of the bones of the skull that should have occurred from 3 to 8 years been made up? These are questions of the greatest importance; the lack of growth will have been made up better than if the case had been treated at 15 years, but not so well as if it had been treated at 5 years of age. In any of these cases it is difficult for me to believe that the normal growth can ever be secured unless treatment be instituted as soon as inhibition of growth occurs, and the longer it is deferred the less the probability of getting normal development becomes, and so the less the probability of natural permanent retention. To make matters worse from the point of view of retention, the new positions of the teeth have been obtained

by mechanical apparatus acting directly on them and not by bone development resulting from muscle activity. Keith says in "Menders of the Maimed": "In all deformities I believe that the transformation of bone is a direct result of defective, unbalanced muscular evidence." Whilst this sentence only indirectly supports my argument, it does so very strongly in conjunction with the whole chapter in which it occurs, and I need only add here one more line from it: "The amount of growth in a bone depends upon the need for it." Now this is not strictly true if we take the view that the growth of the jaws should suffice to contain the teeth in normal alignment, etc., but presumably it is if we take the view that the jaws are developed sufficiently to masticate the diet that the individual has consumed. For the argument to hold good it would have to apply to teeth also, *i.e.* the amount of growth in teeth depends upon the need for them, but unfortunately such is not the case and, if it were, I imagine orthodontics would be unknown as we know it. The trouble about orthodontics is that the teeth are formed so early that their development, growth and size is uninfluenced by the work they will have to do, but the growth and size of the jaw which is to contain them is so influenced. It therefore seems of the utmost importance that all children undergoing treatment of this kind should be put on the most vigorous Sim Wallace diet—in fact diet Sim Wallace, diet Sim Wallace, *toujours* diet Sim Wallace, in order to ensure permanent natural retention.

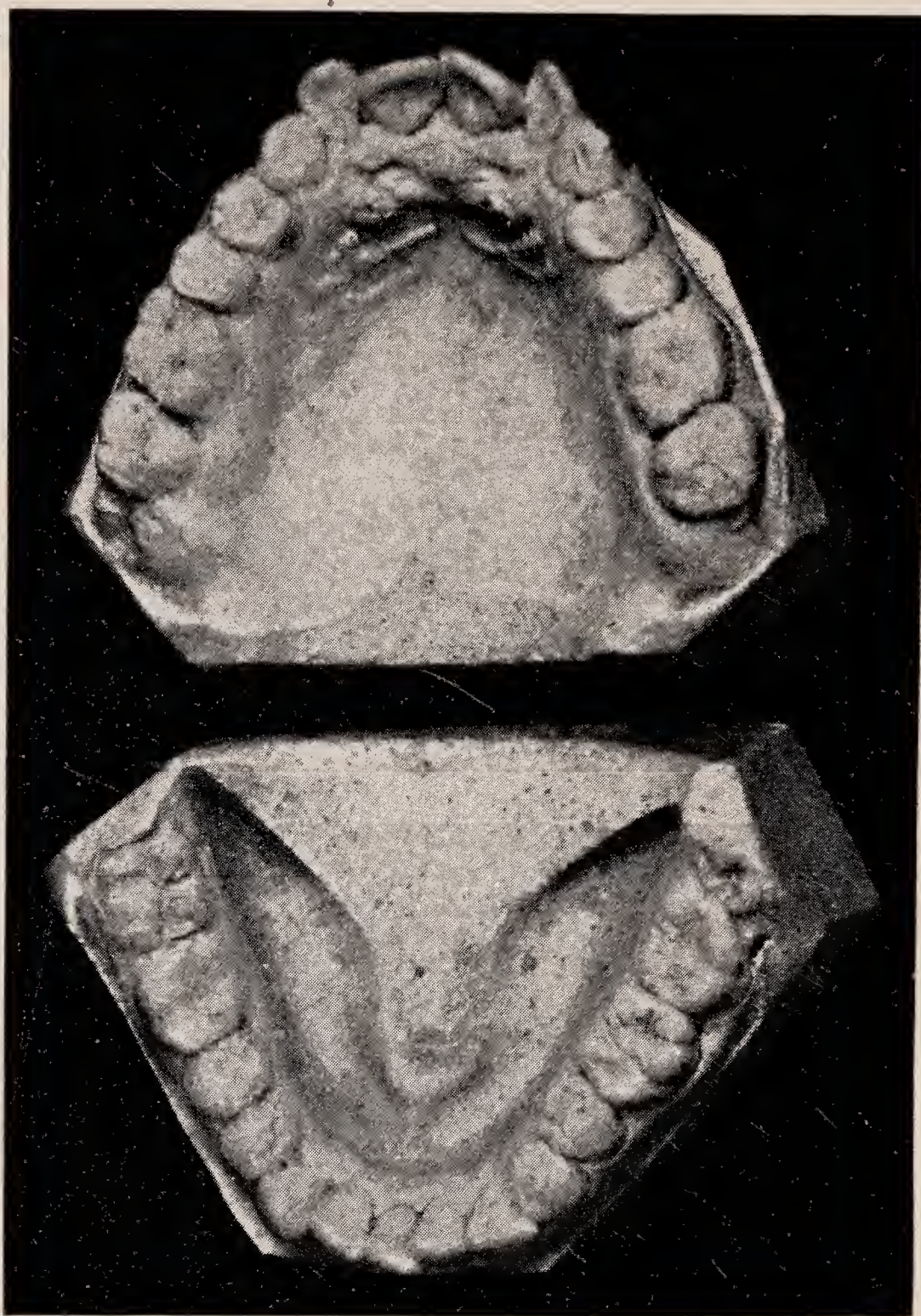
I have spoken too long, but this is a question which has worried me considerably of late, and whilst one knows what good results are to be obtained at 8 years of age, and for older children, without extraction, that is not the point the title of Mr. Northcroft's paper makes, which is "the best age for treatment in relationship to retention." I should have preferred him to have fixed a younger age. The writer and I have discussed this matter many times, and I would have liked to amplify my arguments still further on this occasion, for material to do so crowds before me, but now I must content myself with assuring Mr. Northcroft of my own gratitude to him for writing this paper. The short time in which he has done it furnishes me with a weapon, which I sadly need when asking members to write papers, but perhaps now they will come forth spontaneously like teeth in an arch already crowded, but receiving a warmer welcome. I shall be able to say it doesn't take long—leave the long part to those who discuss it.

(Discussion appears overleaf.)

ORTHODONTIC TREATMENT REQUIRED AT 23 YEARS OF AGE.

Mr. F. BOCQUET BULL said that this was the case of a cinema actress, who had the two upper laterals markedly outstanding, and these showed up in a very pronounced way under the light used in the cinematograph studio. The case was quite an urgent one, because the patient told him that she had lost three contracts owing to the refusal of the producer to pass the presentation. Whatever treatment was suggested must be to a certain extent

experimental because in giving treatment one might worsen the condition. He added that there was congenital absence of one of the lower incisors. He showed a model of the case.



DISCUSSION.

The PRESIDENT said that he thought some of the most difficult cases that orthodontists had to deal with were these cases of irregularities in adults which had received no previous treatment or in which the treatment had been totally inadequate. They were often obliged in these cases to resort to some mechanical treatment in the form of fitting crowns rather than adopt an ordinary orthodontic procedure. It was a matter of considerable urgency to a patient like this, who was unable to follow her profession on account of her appearance.

Mr. G. NORTHCROFT said he thought that orthodontic treatment as commonly understood was out of the question. This was, on account of the time which would be taken and the serious interference with the pursuit of the patient's profession, making it unadvisable at that late age, to undertake the correction of the irregularity by ordinary

means. The case was complicated by the congenital absence of one of the lower incisors, which would make the question of retention an extremely difficult one, and probably unsuccessful in the end. He would, therefore, suggest crowning these teeth. In America he had no doubt that many men would suggest "jacket crowns," thereby dodging the danger of apical infection. Otherwise one had to take the responsibility of destroying the pulps of these teeth, but in this case, the patient was aged 23, and therefore not likely to be a cinema actress for more than ten years longer, if one was successful for at any rate ten years, one might be justified in cutting off the teeth and crowning in the ordinary way. This was on the supposition that Mr. Bull did not see his way to making porcelain jacket crowns. The speaker had made some, but they were difficult, and he thought that in the confined space with which Mr. Bull would have to work, as shown in these particular models, the jacket would be so extraordinarily thin as to make the procedure almost impracticable. Therefore he would be in favour of devitalising the teeth and crowning them. The next point to be considered—and it would be extremely interesting to hear from other members who had experience—was with regard to the liability of artificial teeth to show black on the screen. That had been his own experience with a patient who was a screen actress. But he could not be certain whether these particular teeth were Ash's or American. The teeth should be crowned with the dowel or Logan type, where one had a large thickness of porcelain very highly translucent, which probably would not give black shadows in very strong light. He would suggest that Mr. Bull should get a model or patient with some American porcelain teeth screened as an experiment.

Mr. W. RUSHTON said that some years ago Mr. Samuel Headley published a number of cases in which he performed orthodontic treatment for adults up to 30 years of age. There was not the slightest doubt that if the first bicuspid were extracted on either side, these teeth would be perfectly regular. Whether that would take too long in view of the lady's professional engagements, he could not say. That was for her to decide.

Mr. BULL thanked Mr. Northcroft for his suggestion which he thought was probably the one he would adopt, and the one he had in view. With regard to Mr. Rushton's suggestion to extract the two premolars, he thought that probably any treatment which that would involve would be too long; also it would be perhaps something of a calamity if one did not quite succeed, for the unsightliness might be only slightly shifted, and he presumed that when these cinema actresses smiled, they smiled to the fullest extent. On the whole he was rather inclined to Mr. Northcroft's opinion.

DISCUSSION ON MR NORTHCROFT'S PAPER.

The PRESIDENT said that the Society owed very much to Mr. Northcroft for the valuable work he had done for it in the past, and to-night those present would all agree that the debt had been increased by the paper which he had just presented. They could not help admiring the really beautiful models which Mr. Northcroft always brought forward when he showed his cases at the Society meetings. He (the President) thought that Mr. Northcroft had demonstrated very clearly the great importance of the early treatment of orthodontic cases. As Mr. Northcroft had said, they might possibly learn more from observing the results in cases which had not been treated than from those which had been dealt with successfully. He would certainly strongly support his plea for the taking of models very early in childhood. Models should be taken and occlusion recorded at the earliest possible moment of all children who came under their care, and they

must remember, as Mr. Northcroft has already mentioned, that in the normally developed jaws of a child of five the temporary teeth should be spaced, and, moreover, that there were other changes taking place, apart from the spacing of the teeth, which indicated the growth of the jaw. There was, as had been observed by others, an alteration in the relationship of the mandible to the maxillæ, and frequently, just previous to the eruption of the first permanent molar, the incisors tended to occlude edge to edge instead of posteriorly, and this edge to edge occlusion, which was the result of the growth of the jaws, did control considerably the conditions with which orthodontists had to deal in the future. With regard to Case 1, which Mr. Northcroft rather hinted as being a case which tended to disprove Dr. Bogue's view that the absence of lack of spacing was not necessarily an indication of a tendency to orthodontic deformity in the future, he (the President) thought that perhaps one might suggest that in that particular case orthodontic deformity might have occurred if the teeth had been as large as many teeth were, and for that reason Dr. Bogue's view was not altogether contraindicated by the case Mr. Northcroft had quoted.

Mr. CHAPMAN showed models of a case of Class I the treatment of which was started at 6 years and 4 months of age.

Treatment occupied eight months. The increased width in the molar region, one year after retention was started, amounted to 7 mm. Retention was maintained for two years and two months, except in the case of a lower central, which was rotated; the tooth was retained for two years longer. Models taken recently, almost ten years after treatment was started, show expansion of 4 mm. in excess of that before the case was started, or a relapse of 3 mm. on the expansion as it existed one year after retention was instituted.

Mr. CALE MATTHEWS said that the Society had had a very instructive and delightful evening. The difficulty of treating cases in the early stages was largely due to the ignorance of the parents. He thought that as general practitioners they must emphasise the necessity of children being sent to them early. Only so would material be obtainable for treatment. The statistics—if one might so term what Mr. Northcroft had put before them that evening—were most interesting. It had always been his own ambition—and he thought it should be one's ideal—to correct his cases by natural position, and the maintenance of position by artificial means was always to be deprecated when it was possible to do without it. Fears regarding long retention were often groundless. If the case was properly corrected, the period of retention need not be so long. He did not quite follow Mr. Northcroft's opening remarks, but he would have thought it so obvious as not to need expressing in a paper before this Society that the necessity of commencing treatment at the earliest age possible should be taught to and known by the profession. Thanks were due to Mr. Northcroft for the fine display of models illustrating the cases at every stage which he had placed in the epidiascope.

Mr. W. RUSHTON said that the only thing which struck him in Mr. Northcroft's second case was the amount of trouble the child was saved by not being treated at an earlier stage. It was a desirable thing to have left that case until an age when the teeth obviously had to be extracted.

Mr. MAXWELL STEPHENS said that he thought Mr. Chapman was under a little misunderstanding in one respect. Bone developed according to the muscular stresses which made a demand on it. He recalled the fact that the trabeculæ of bone in the case of the femur forming the process in which the muscle was inserted arranged themselves according to the stress. He could not help thinking that if the stress was normally placed in the bones of the face as early as possible in the existence of the child some such formation parallel

to that in the femur must be induced. He would like to ask one question of Mr. Northcroft: What happened to the wisdom teeth in those cases which he had placed in normal occlusion early in existence?

Mr. HAROLD CHAPMAN asked whether he correctly understood Mr. Northcroft to say that in the case in which the molars went lingual to normal in the upper jaw, and which were shown by him in a later model in correct relation with the teeth, they returned to buccal and correct relationship of their own accord without any treatment.

Mr. NORTHCROFT said that Mr. Chapman was mistaken as to the conclusion of the case; they finished up by being lingual to normal.

Mr. H. C. HIGHTON asked what method Mr. Northcroft had adopted in the case of pre-normal occlusion which he had treated. He had treated a case aged 5 years himself with no relapse occurring. Mr. Northcroft's case was treated at 2 years 11 months (Case 7).

The PRESIDENT said that there was one point with regard to the question of early treatment which perhaps might not be fully understood. It was with regard to the date which Mr. Northcroft suggested. It occurred to him that some of the members, in discussing the early treatment, were considering rather the mechanical treatment and excluding the other. Mr. Northcroft did mention that the treatment so far as adenoids were concerned should be dealt with as early as 5 or 6, and he thought that was a very important part of the treatment.

Mr. S. F. ST. J. STEADMAN said that he thought they must be cautious before drawing too large a conclusion from the case of the rabbit which Mr. Chapman had instanced. He (the speaker) would be the last to say that function was not of the greatest importance in bringing about the growth of jaws, but if one got rid of all the defective teeth in a child one still got, apparently, jaws of normal sized growth. One would assume from Mr. Chapman's paper that if teeth were taken out early in the child's life there would be less growth of jaw than normal. But that was not so. He had taken out a large number of teeth in children for caries, and one got apparently the normal growth.

Mr. GEORGE THOMSON referred to the difficulty of getting the co-operation of patient and parents. He remembered a lady telling him that her mother died when she was very young, and her father was a very careful disciplinarian. She was in the habit of biting her nails, and every effort was made to get her by discipline to discontinue that habit. One day when she was 15 years of age, a lady visitor commented upon her nice hands, but added, "You will not have nice hands if you bite your nails." It was such a word as that, spoken at the psychological moment, which availed to make her stop the habit. Their advice in the matter of what should be done orthodontically was often disregarded, but much depended upon getting the patient—or in the case of a child his parents—to see for themselves, and then they were assured of all co-operating together. With regard to the non-eruption of teeth, he knew of a case where this difficulty was present at 12 years of age, when there was no sign of the premolars in the lower jaw coming through at all. They all knew how erratic teeth very often were as to the period when they erupted. There were thus practical difficulties in the way of fixing any definite age for the treatment of these cases. Mr. Northcroft's suggestion—for which they were much indebted to him—was to fix a period such as 8 years of age, and this seemed really the ideal age if the other conditions were favourable for carrying out the treatment.

Mr. NORTHCROFT, in reply, said that he had to thank the meeting for its very kind reception of his all too feeble effort. The President had referred to the question of Bogue and early treatment. It was

his (the speaker's) desire simply to say a word of caution against taking Bogue too literally. He thought one was quite justified in waiting till the age of 8 to see what size the permanent teeth were going to be before one started treatment. There were exceptions to all rules, and there were some very obvious cases of overcrowding and irregularity of the temporary dentition. But when one got the ordinary non-spacing of the teeth at the age of 5 one ought to be cautious about expanding at that age. Mr. Steadman had brought up the question of cases in which all the temporary teeth had been removed and a perfectly regular permanent dentition had resulted. Such cases were in existence without a doubt, and he himself had several cases where either the left or the right side of the lower jaw had been in lingual occlusion, and that side consequently not functioning (although the teeth had been there, they had not been used), and yet the jaw had developed very nearly normally. The anteroposterior diameter of the jaw had not been interfered with at all, and the lateral diameter only slightly.

He had been very much interested in the 6 year old case that Mr. Chapman had shown, for it admirably illustrated his own point that if teeth were found erupting in a jaw in a child aged 5 or 6 that ought to erupt in the jaw of a child aged 7, it did not necessarily mean that there was a lack of bone growth. The jaw was the jaw of a child aged 5 or 6, as the case might be, but the teeth were adult teeth in size and had tried to come up in position in a jaw one or two years too young, and thus there was crowding. He did not think it was necessary to argue that there was a lack of development in the jaw. The bone had not had time to grow sufficiently. Mr. Chapman had brought up another point which seemed absolutely contradicted by the jaw that he himself had shown in Case 144 at 19.3 years. Mr. Chapman said that the growth of bone only occurred where there was need for it. But in his (the speaker's) case that mandible—which was in functional occlusion with the maxilla at the age of 13, had outgrown the upper jaw six years later, at the age of 19, and the cheek teeth in the upper jaw were in lingual occlusion in consequence; the growth of bone had not occurred because there was need for it to grow, but had gone on growing for some other reason.

Then, again, Mr. Chapman had stated that these cases ought to be started upon still earlier than 8. He (the speaker) had simply tried to lay down some broad lines of guidance so that in the schools and elsewhere it might be taught that the average best age of treating cases was 8 years, and that teaching should be modified accordingly. He thought that the desirable age to treat cases was 8 years. Mr. Chapman had suggested that a start could not be made too early if the patients could be got sufficiently interested, and so on, and if it was a practical proposition. But the practical difficulty in the way of starting a case at 6 years old was that one would thereby lengthen the period of retention. By starting at the age of 8 instead of 6, the period of retention was reduced by, roughly, two years, in his opinion, and yet a start was made early enough to stimulate bone growth.

Mr. Rushton had suggested that it was a desirable thing to have left his case 303 until an age when the teeth obviously had to be extracted. But Mr. Rushton did not see the models in occlusion on the screen, otherwise he would have seen that the central incisors were projecting over the lower lip, and also the irregularity of the whole arch. No extraction would ever put those incisors in their correct position. The case had to be mechanically corrected; it was too ugly to be left as it was.

In reply to Mr. Maxwell Stephens, he did not know what happened to the third molars in many cases. In his case 144 the third molars were just erupting, and apparently the jaw had gone on growing sufficiently for these teeth to come in their proper position. He had had cases, on the other hand, in which the third molars had been

crowded out of the arches, and he had removed them. In fact, he removed a great many third molars—not orthodontic cases at all. The risk of functionless teeth becoming septic was very great.

Mr. Highton wanted to know how the pre-normal case was treated at 2 years and 11 months. He thought it was treated by the aid of mechanical toys mostly! The child used to be given a clockwork mouse very nearly every time she came to see him. At the first visit he was fortunate enough to be able to put screw bands on the d's and insert an upper arch to which he could lace the four incisors, and all he could do at subsequent visits was to screw up the nuts on the arch. Thereby he pushed out the incisors over the arch, and natural retention took place. His idea was that the teeth being in normal occlusion, the jaw was functioning quite naturally, and there was no undue stress. He had always thought that in many Class III cases one could notice the case getting worse and worse simply because of the thrust of the jaw in mastication, and he was sure that if the jaw occluded early enough there was not the same tendency to the protrusion of the lower jaw. He did not think these Class III cases always due to over stimulation from the pituitary, and causes of that kind; some of them might be due to acromegaly and so on, but many were not.

Then, of course, there were means of treatment other than mechanical to be used as the President had suggested. He believed the ideal age for orthodontic mechanical treatment to be 8 years, but he considered it his duty as a dental surgeon to instruct any parents who brought their children to see him in the whole art of looking after their children's mouths. He gave them a talk on the necessity of making the jaws function properly, on seeing that the children were fed properly, on the undesirability of giving the children sweets at night or of giving them too soft food. He spoke to them on the necessity of stimulating the growth of the jaws by eating hard foods. He questioned them also about mouth-breathing. All these things were gone into as part of his function as a family practitioner, and it was not this kind of treatment that he was referring to at all when he laid down the age of 8 years. Parents were always asking at what time they should bring their children to him, and his reply was, "As soon as you can persuade them to come," and he added, "It is absolutely essential that your child should come and see me at 3 years of age." Dental surgeons should try to train the parents in their practice to give the children the best chance according to their lights.

AN Ordinary Meeting of the Society was held at 11, Chandos Street, Cavendish Square, W., on Monday, October 3rd, 1921, the President, Mr. J. LEWIN PAYNE, in the chair.

The following newly-elected members signed the obligation book and were formally admitted to membership of the Society : Mr. S. H. Roe and Mr. Barrington Eady.

The following were ballotted for and elected : Mr. Alexander B. Aldred, L.D.S.Eng., Mr. W. E. Coe, L.D.S.Eng., D.M.D.Harvard, Mr. W. W. Whittington, L.D.S., and Mr. A. G. Wilson, L.D.S.Glas., D.D.S.Penn.

The following communications were read.

ORTHODONTIC TREATMENT COMPLICATED BY REPLANTATION OF AN UPPER LATERAL.*

By WALTER A. CRANE, L.D.S.

THIS case is not intended as an orthodontic triumph at all, being a small case which presented itself minus the left upper lateral incisor. On December 20th last year the child was brought for consultation, and examination proved, as will be seen from the models, that the molars were in slightly distal occlusion. The upper centrals were rotated distally, while the right lateral was very much protruding mesially, with no signs of the left one, which



proved to have been kicked out during physical exercise at school fourteen days before. The socket was almost granulated up, but not completely so. A hunt was made for the tooth, and it was brought in the following day covered with garden sand and ink, and I attempted to wash it as well as possible in hot water without actually boiling it, and soaked it in normal saline solution for eighteen hours. The canal was cleared out and filled in the usual way with G.P. points. On the sixteenth day after the accident the lateral was replanted under novocaine by curetting the socket, and fastened with the usual covering splint. The child had a tubercular scar of twelve months' duration on her neck, and the mother was anxious to have no more done than absolutely necessary for fear of injuring the child's general health.

In the first model you will see the slightly distal condition of the molar with the crowded condition in the front.

* Delivered to the British Society for the Study of Orthodontics.

The splint was taken off on April 1st, three months afterwards. The position on the model shown here corresponding, from the mother's statement, to that before the accident, though at the time of replantation some difficulty was experienced owing to the central and canine having come somewhat together.

The tooth is perfectly healthy, with no sign of a pocket of any description. I thought it right to insert an inclined plane in the upper jaw, and you will see the models of the case as it is now. It is not otherwise an exceptional orthodontic case, but as the mother would not undertake any further treatment than permitting the centrals to be rotated and drawn out with an Angle's apparatus, and an inclined plane put in as a retention apparatus, the treatment had to cease.



The PRESIDENT said Mr. Crane had presented a case of some considerable interest, and, although it varied somewhat from ordinary orthodontic treatment, it was no doubt a matter which the members would like to discuss.

Mr. PITTS suggested that in a case where the tooth was contaminated with soil there might be a possible risk of tetanic infection. The method of sterilising the tooth did not seem very adequate from that point of view, and he would like to know if planting the tooth in the socket provided any ground for such an organism, which was anerobic.

The PRESIDENT said that some years ago he remembered Mr. Morton Smale referring to a case which came under his experience of a replantation of a lateral incisor tooth. It occurred in a fellow school-mate. The lateral incisor had been displaced in the school playground when the patient and Mr. Morton Smale were schoolboys together. The tooth fell on to the ground and was immediately replaced in its socket, and Mr. Morton Smale heard no more concerning it until he met his fellow student twenty years later, when the matter was referred to. On looking into the mouth Mr. Morton Smale discovered that the tooth was still there. The only point of difficulty about it was that the tooth had been placed the wrong way round and had remained in that position from the time it had been replanted. The importance of such cases of replantation was that the teeth should be replaced immediately, and if the replantation was done under the precautions Mr. Pitts had mentioned, not only was it possible to maintain the healthy activity of the peridontal membrane but the pulp would remain vital also. He believed in Mr. Morton Smale's case the pulp was vital even after the twenty years.

Mr. WARWICK JAMES said he had once had a case at the Dental Hospital of a boy with a large dentigerous cyst associated with the left central incisor in the maxilla. The right central was displaced and rendered useless. The cyst and both the teeth were removed. Later the lateral incisor appeared at the posterior margin of the hard palate, apparently displaced by the cyst, and the right lateral had fallen a good deal across to the left side. He thought nothing could be lost by attempting transplantation of the tooth. He made a socket and removed the lateral from the palate and placed it in the best position in the front of the mouth, and the boy retained that tooth, and when he saw him three years later it was quite satisfactory. The house surgeon said that it reacted to heat and cold, but he himself thought it was very slow in its action. He did not destroy the pulp. It looked as if the tooth might remain for a very long time. The greatest difficulty he had was in obtaining tissue. There was so much loss of tissue owing to removal of the cyst that the fold remaining was only about one eighth of an inch thick, gradually widening towards bone. Only a short portion of the root of the tooth could be inserted in the bone, a socket being made by the use of a fine antral drill. He thought it an extraordinary thing that it should remain as it had done.

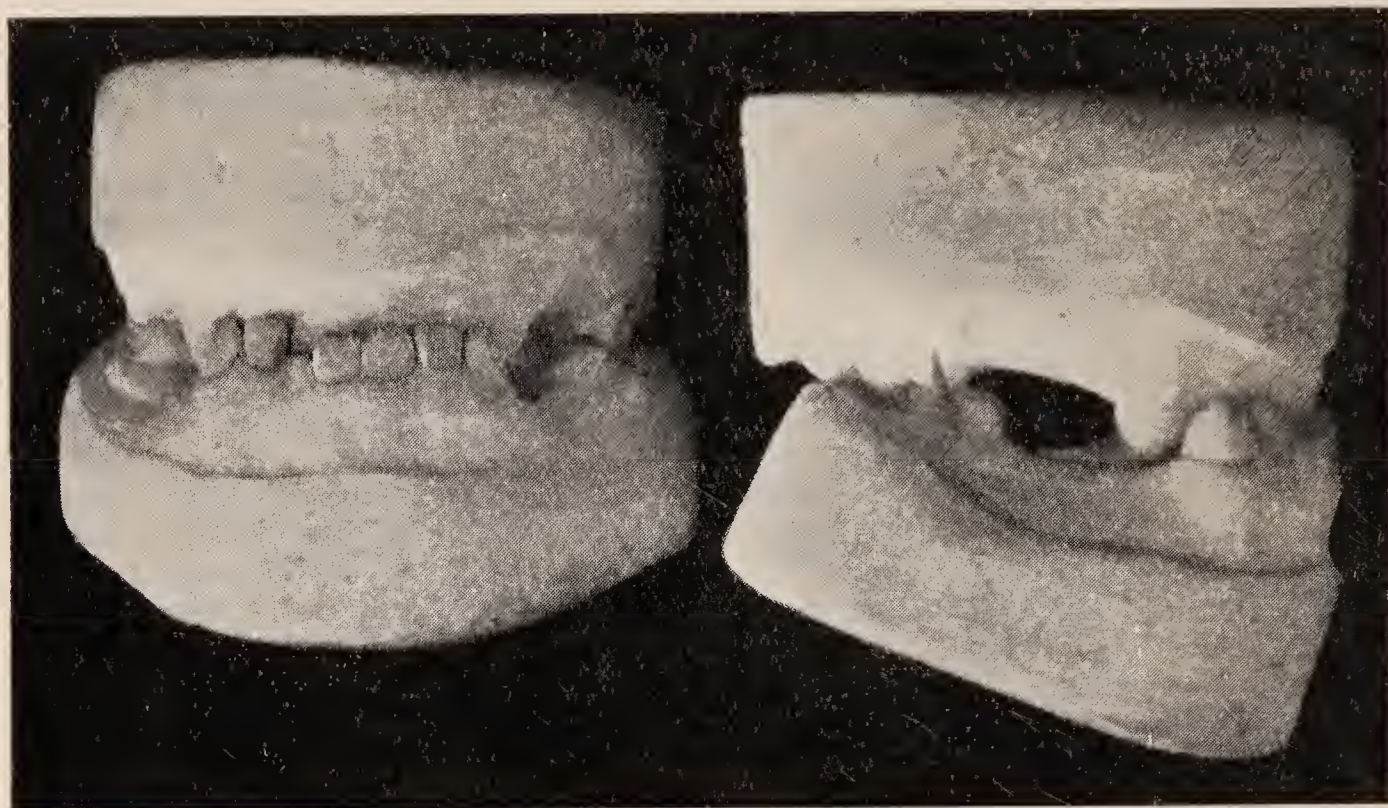
Mr. CRANE quite agreed with Mr. Pitts, and said that his heart was in his mouth when he replanted the tooth as regards transmitting any infection. It was washed in hot water as well as possible and soaked. The proof of the pudding, however, was in the eating. It was not very surgical, but the child was in extremity and was going to be a pretty woman. It was a case of taking a chance. After fourteen days he did not risk more thorough sterilisation, as there were a few fibres of periosteum still adhering to the root which he did not wish to destroy, if it could possibly be avoided.

A CASE OF UNDERHUNG BITE.

By F. ST. J. STEADMAN, L.D.S., L.R.C.P., M.R.C.S.

THESE models illustrate a case of underhung bite in a boy aged $6\frac{1}{2}$ years. The father and the father's sister also had the same

condition. He had only seen the patient recently, when he had the condition shown in the models. The interesting question was whether anything could be done for him. Personally he was inclined to leave it alone and do nothing. The actual cause appeared to be the usual one in such cases, an overgrowth of the ascending ramus. The only permanent teeth present are the six-year-old molars and left lower central incisor.



Mr. HAROLD CHAPMAN said the case was a very interesting one and it would appear that there was a question of heredity involved, and one would be inclined to put it as a Class III case. The four permanent molars seemed to be in normal occlusion, but that might be only relative, on account of unequal medial movement due to the early loss of the deciduous molars. It is conceivable that they might have moved equally, so that the case might belong to Class I. It was rather difficult without very careful examination to decide, but whichever class it was it seemed to him that the appearance of the boy when he was 10 or 15 years older would be considerably marred if the condition were perpetuated. He would be inclined to undertake treatment to correct it, certainly when the permanent incisors were erupting in the upper jaw, if not at the present time. He had only recently seen a similar case but rather older, with regard to which the parents were not willing to have anything done at all if it was only a question of improving the boy's appearance, although if it was a question of health they were willing to have treatment undertaken. While he could not assure them that it was detrimental to health, he felt sure that in ten years' time it would be detrimental to the boy's appearance, and the same applied to Mr. Steadman's case.

Mr. STEADMAN said the boy's appearance at the present moment was distinctly good and he was not at all sure that he agreed with Mr. Chapman that in underhung cases the appearance was necessarily bad. He had seen plenty of underhung people with faces quite good. It looked worse in girls than in boys. The boy he had referred to did not now show that he had an underhung bite at all.

TREATMENT OF CASES IN WHICH THE BITE IS TOO CLOSE.*

By W. WARWICK JAMES, O.B.E., F.R.C.S., L.D.S.

THIS paper is the outcome of a consultation with one of our members in which he advised extraction of premolars whilst I urged retention. There were many reasons in support of his

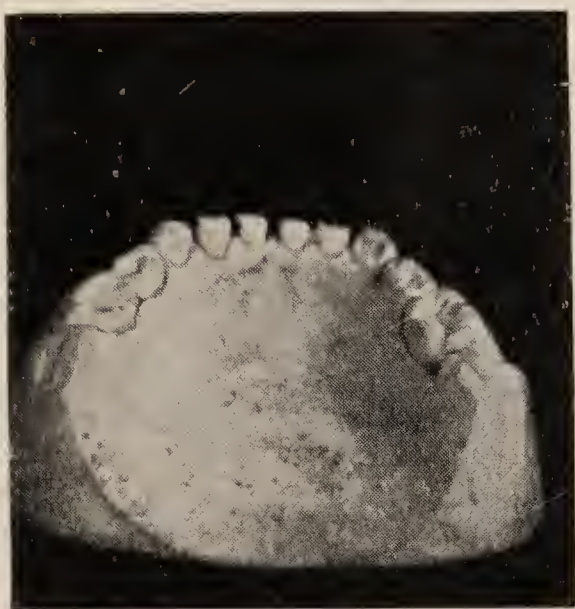


Fig. 1.

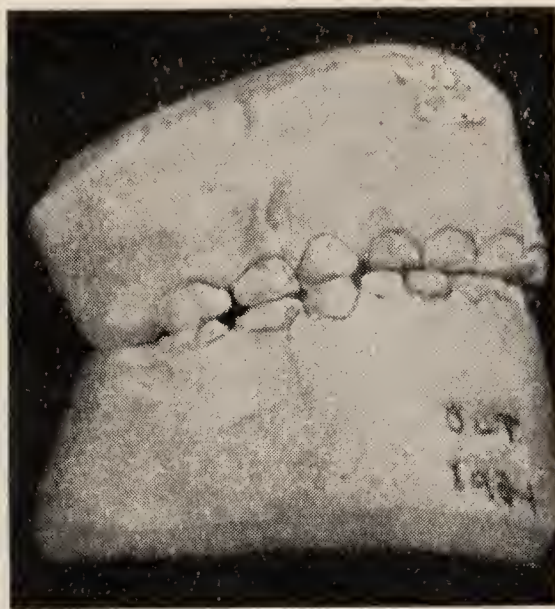


Fig. 2.

FIG. 1.—Model of the mandible of a boy aged 5, showing spacing of the incisors which have undergone attrition from edge to edge occlusion.

FIG. 2.—Models showing the advanced mandible and attrition of incisors. The first molars are about to erupt and the tissues over them are seen to be in occlusion.



Fig. 3.

Fig. 4.

FIG. 3.—Models, of a boy aged 2 years 5 months, showing post-normal position, with lower incisors completely hidden and impinging upon the gum of the maxillæ. The second temporary molars, particularly those of the mandible, are imperfectly erupted.

FIG. 4.—Models, of a boy 1 year 7 months later than Fig. 3, showing the second temporary molars have been permitted to erupt and the mandible advanced, bringing the incisors into almost correct occlusion, the changed relationship of the temporary canines also being noticeable.

* Read before the British Society for the Study of Orthodontics.

FIG. 5.—Plate used in case shown, Figs. 3 and 4. It was worn constantly night and day and the occlusion with the plate in position is such that the forward position of the mandible is the only efficient one that can be assumed during mastication. Those having care of the child constantly directed him to keep the lips closed.

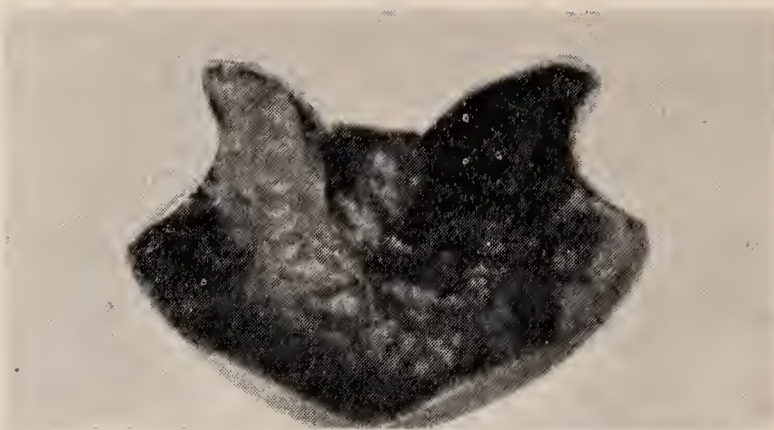


Fig. 5.



Fig. 6.

Fig. 7.

FIG. 6.—Models of a girl aged 13 with marked post-normal occlusion. The protrusion of the maxillary incisors was most unsightly, whilst the backward position of the mandible completely spoilt the balance of the face.

FIG. 7.—Models of case shown in Fig. 6 at 17 years. The molars have been allowed to erupt and the mandible advanced. The bite-plate was similar to the one shown in Fig. 10, the maxillary premolars and temporary molars were capped, "raising" the bite, whilst an inclined plane upon which the mandibular incisors impinged, compelled the forward position to be assumed. The narrow maxillary arch was expanded by means of the jack screw (Fig. 11), and as the width of the arch increased, new plates had to be made or a new jack screw inserted. The patient was directed to cease turning the screw when the halves of the plate began to work loose, but to continue wearing the plate until she could be seen; in this way some weeks' interval can be tided over when the patient is at school.

A plate as shown in Fig. 17 was used as a retention plate.



Fig. 8.

Fig. 9.

FIG. 8.—Models of a girl aged 9, showing the imperfectly erupted mandibular molars, which is more marked than in those of the maxillæ, as is usually the case, although all are affected.

FIG. 9.—Models of case shown in Fig 8. Patient is now aged 11 and still under treatment, the bite-plate being worn: the open bite due to the more fully erupted molars which are in occlusion when the bite-plate is in position. The second premolars have been freed and are being allowed to erupt. The protrusion of the maxillary incisors is being corrected by the use of rubber dam at nights (Fig. 16). The lower incisors bite upon the vulcanite of the palate plate, which has been filed behind the maxillary incisors at the points which would prevent their retraction.



Fig. 10.

FIG. 10.—Vulcanite bite-plate showing the capping of the temporary molars or premolars, and the plate divided for expansion by means of the jack screw. Difficulty in keeping the plate in position is met with occasionally; the necks of the teeth should not be touched, but the hollow for the cusps may be increased by drilling out the vulcanite or by placing a thin layer of metal (patten lead) over them before vulcanising.

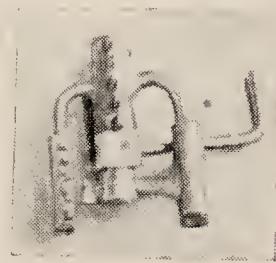


Fig. 11.

FIG. 11.—Badcock jack screw with second guide added. The plate is rendered much stronger and steadier by adding a second guide which should be stronger than the one made with the screw part.



Fig. 12.

Fig. 13.

FIG. 12.—Models of a boy aged 11½ with post-normal occlusion and the mandibular incisors impinging upon the gingival margin immediately behind

the maxillary incisors. The bite-plate was worn continuously in spite of several teeth having been filled, no new carious cavities arising. The plate was scrubbed twice daily with a nailbrush and swilled under the tap after each meal; these being the usual directions given to the patients.

FIG. 13.—Models of case shown in Fig. 12, 14 months later. The case is still under treatment. The occlusion has been altered and the maxillary arch expanded by the method usually adopted. A plate similar to that shown in Fig. 17 is being worn, and rubber dam used at night. The boy is away at school and can be seen only in the holidays, as is the case with many of these patients. Some patients have been seen once during the term when the expansion screw has become too loose for the plate to be worn with safety.

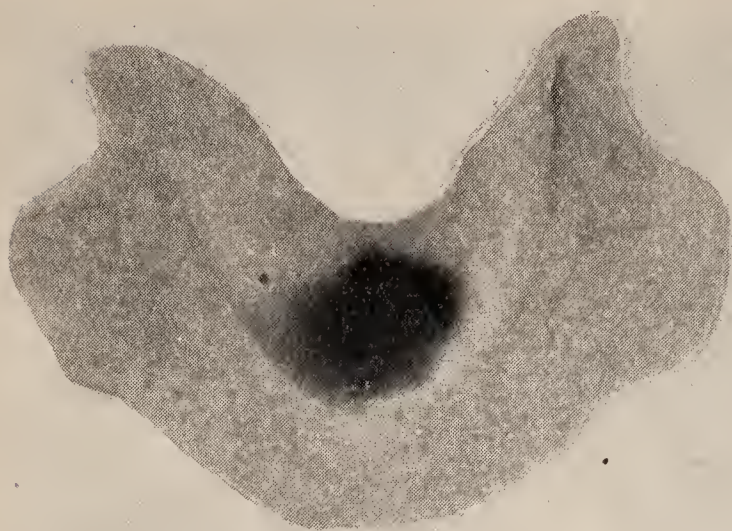


Fig. 14.

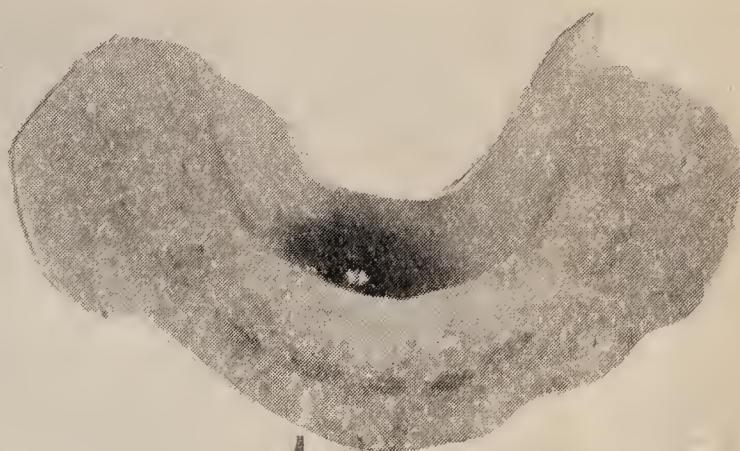


Fig. 15.

FIG. 14.—Wax made up on plaster model, capping the temporary molars or premolars (in some cases, particularly young children, the temporary canines or even the incisors (see Fig. 5)), with an inclined plane for the mandibular incisors to impinge upon whilst the first permanent molars are left free (the second temporary molars in early cases).

FIG. 15.—Wax as in Fig. 14 upon which the patient has been allowed to bite. The redundant wax in front of the marks of the incisors would hide the maxillary incisors if the wax were upon the model.

The correct bite is best secured by obtaining an edge to edge occlusion of the incisors and allowing the mandible to slide backwards until the correct position is obtained. It may be necessary to add wax to the incisors inclined plane which must be so arranged that efficient mastication is only possible in the forward position.



Fig. 17.



Fig. 16.

FIG. 16.—Shows a bite-plate cut for expansion but to show particularly the hook inserted in the vulcanite of the wing overlapping the premolars. This type of hook has been found to be the most suitable form for holding the rubber dam which is stretched across the front teeth of the maxillæ at night. The smooth surface shows where the plate has been cut away to allow the

incisors to be retracted, whilst sufficient vulcanite has been left to occlude with the mandibular incisors, which are prevented from rising.

FIG. 17.—Shows a retention plate which maintains the arch. The mandibular teeth being unable to occlude in any other than the forward position, in due course establish occlusion in this position, the elevated molars being the chief factors in effecting this change. The hooks for retracting the incisors are here seen soldered to the wires which support the plate.

argument—neither patient nor parents were likely to be helpful with the treatment, the second molars were presenting, and the boy went away to school, rendering regular attention very difficult. During our discussion I realised that I had adopted a new line of procedure which had as a base the old bite-plate, but with a marked modification. I therefore promised to bring the subject before this Society.

Two special features of my method of treatment need to be emphasised—one, that the molars are permitted to rise (more correctly develop) until the bite is propped open; the other, that treatment be undertaken at as early an age as possible.

Time does not allow me to discuss the many views explaining the changes during development of the jaws, whether normal or abnormal, but I would like to give you some of the steps in my own reasoning. As a student in the 'nineties I was taught that in the majority of cases the only effective method of treatment of cases of irregularity of the teeth was by extraction. Expansion of the maxillary arch by means of the Coffin spring was attempted occasionally, but with extraordinarily little success. Fixed appliances (then recently introduced by Mr. Angle) were much discussed, but regarded as too complex for hospital patients except for the purposes of teaching. In one case, which lived in my memory, a Coffin expansion plate was used capping the premolars; directions were given to the patient to stretch the spring daily. She was prevented from returning to the hospital for six months, but when she did so, not only had the arch expanded, but the malocclusion was corrected. Inadvertently my present method had been practised.

As the result of considerable experience in private practice, and as dental surgeon at two hospitals, it seemed possible to correct malocclusion in two planes (lateral and antero-posterior), but the third (vertical) seemed too difficult, as I stated in a paper read at the International Medical Congress, 1913,* from which I would like to make a quotation as expressing my views at that time:—

“The succession of changes in the process of development of the jaws during the period under discussion comprises growths of the bones and eruption of the permanent teeth with loss of those of the temporary series.

“The development of the bones is such that the additional space required for the permanent teeth is supplied, growth takes place in several directions, but the exact changes are not definitely known. It seems possible that the presence of the teeth may have a special influence; interstitial growth has been assumed to take place in the mandible, although it is most difficult to conceive.

“Prior to and during the period of eruption of the permanent teeth the development of the jaws can be observed. The dental

* One of the papers read before the joint sections of Hygiene and Preventive Medicine and Stomatology, opening a discussion on “The Supervision of the Health of Children between Infancy and School Age.”

arches increase in size, the incisor teeth of the temporary dentition become spaced; the jaws in the region of the temporary molars are wider, as has been shown by measurement in a few cases; and the jaws show an increase in length in the antero-posterior direction in order to allow the first permanent molar to come into position. A change which, in the opinion of the writer, is of great importance consists of an alteration in the relationship of the mandible to the maxillæ. Previous to the eruption of the first permanent molars the mandible appears to develop in such a manner that the incisors no longer occlude posteriorly to those of the maxillæ, but assume a more or less edge-to-edge occlusion. The marked attrition of the temporary incisors is explained by this change, and is an indication whether it is occurring or not. The normal occlusion of the first permanent molars is permitted by this change; but if it does not take place the mandibular teeth will probably assume a post-normal relationship, as the second temporary molars will still have their posterior surfaces in almost the same vertical plane. The establishment of this view is difficult, as the movements of the mandible are so free in a child, a very wide range being possible. Models show the edge-to-edge occlusion is probable, but also that other positions are possible. It is sufficient to examine the mouths of children to be sure that this edge-to-edge occlusion occurs. It is my opinion that a case calls for careful consideration if the attrition marks on the temporary incisors are not definitely seen at the age of $5\frac{1}{2}$ years.

"Normally the teeth should stand upon well-formed alveolar processes; too little attention has been directed to imperfect development in a vertical direction, probably because the treatment of the condition appears almost hopeless. This condition is only too common, and is associated with recognised imperfections in the development of the jaws.

"Some of the causes of imperfect development of the dental arches are known, but our present knowledge cannot be regarded as other than vague. That nasal obstruction is a most potent factor is certain; that loss of temporary teeth at an early age is a cause of much importance has long been recognised, although in some cases ill-effects do not result; of the deformities caused in infancy, those produced by habits constitute a larger group than has been thought; the general development of the child may be impaired by ill-health, by insufficient or poor food which may have a local effect as in the case of rickets. Local affections also may exercise a marked influence.

"The interest which is now being taken in the deviations from normal development of the temporary dentition should be productive of a far greater knowledge than we now possess of the normal changes in the jaws. Until quite recently dental surgeons did not attach much importance to the stages prior to the eruption of the permanent teeth."

Later in the same paper, in reference to cases of post-normal occlusion, I said:—

"Where the mouth is constantly open the muscles are at a disadvantage in supporting the mandible and the structures attached to it below. The weight of the pharynx and larynx constantly tend to displace the mandible in a downward and backward direction. In mouth-breathers where the jaws are not occluded this force is sufficient to hamper advancement, or may actually cause

backward displacement of the mandible. This view is introduced as it partly accounts, I believe, for the impaired respiration in mouth-breathers, the backward displacement of the tissues causing some obstruction. It is well demonstrated in patients under an anæsthetic, particularly in a sitting position, for if the mandible be pulled forwards respiration is markedly free, whilst backward displacement of the mandible with the mouth open causes marked obstruction. In the dead subject, when the muscles are quite passive, the mandible from the mere weight of the structures attached assumes a posterior position. A child whose mandible had assumed a post-normal position (associated with tongue-sucking) was advanced with such marked benefit to health that the father, a medical man, commented upon it. The greater freedom of respiration seemed to be the only explanation. The dental arches were well developed, and there was no nasal obstruction. It has constantly been stated that imperfect aeration of the blood is a result of nasal obstruction, and the view expressed above may be the true explanation, as apart from this there does not seem to be any reason why air should not enter as freely through the mouth as the nose."

I would also like to quote from another paper in which my views affect the question under discussion. In 1909 I wrote a paper upon the eruption of the teeth.* Later in a paper written with Mr. A. T. Pitts† upon the dates of eruption of the teeth, the views expressed in the former paper were summarised as follows:—

"A completely erupted tooth presents the following characteristics: the crown of the tooth projects so that all the enamel is exposed except that portion covered by the free margin of the muco-periosteum (gum). The root of the tooth is firmly planted in the alveolus, which should be on a level with the neck of the tooth. The periodontal membrane is completely developed. The gum is firmly bound down to the bone, presenting a thin, even margin in close contact with the tooth immediately beyond its continuation with the periodontal membrane.

"The changes occurring during the period between the earliest state, when the tooth is buried deeply in the tissues, and that of complete eruption, need to be considered. Much discussion has taken place concerning the nature of these changes. It would appear to us that there are two distinct factors bringing about this alteration:—

"(1) A process of advancement of the tooth in the tissues; this is generally recognised.

"(2) A process of denudation by absorption of the tissues overlying and surrounding the tooth.

"With regard to the first factor, we are of the opinion that the point of eruption is determined by the presence of the epithelial columns connecting the oral epithelium with that lining the tooth-follicle. The advancement of the tooth is partly due to unequal rates of growth between the various tissues surrounding the tooth. We think it probable that the elongation of the root plays some part in advancing the tooth as represented in the following diagram.

* "A Preliminary Note on the Eruption of the Teeth." A paper read before the Odontological Section of the Royal Society of Medicine, 1909.

† "Some Notes on the Dates of Eruption in 4,850 Children under Twelve." Paper read before the Odontological Section of the Royal Society of Medicine, February, 1912.

(An illustration was introduced here representing a tooth situated close to the lower border of the mandible.)

"This is supposed to represent a lower incisor ; we know growth occurs at the point marked with an arrow. As the crown is calcified, it must either advance or the tissues below must be replaced. It is impossible to imagine, when we consider the length of the root, that concomitant growth of the jaw takes place to the same extent ; and if X-rays of the jaw—*e.g.*, those of Symington and Rankin—be examined, it will be seen that the base of the tooth where the root is going to be formed is so situated that it cannot be elongated in a downward direction. Another factor in the different rates of growth will appear to be the activity of the immediately supporting tissue which may be regarded as carrying the tooth to its final position, a view supported by other observers.

"So far, we have considered the unequal growth of tissue in a vertical plane only, but concurrently with this, unequal growth also occurs in a horizontal plane. Sections made by one of us show that the epithelial column, connecting the oral epithelium with the follicle, undergoes degeneration centrally, and proliferation of the deeper cells of the oral epithelium takes place. With this change an unfolding occurs in the upper part, thus exposing a lower portion which in its turn undergoes a similar change. This reduces the depth of the tissue overlying the tooth, which is therefore passive so far as the change is concerned. The process may be compared to the opening of a book, the hinged portion being advanced *pari passu* with the separation of the pages of the volume until it comes to occupy the same level as the free edges.

"The second point that we wish to make is the process of denudation as a factor in exposing the teeth. This factor plays an important part in the final eruption of all teeth, coming into play earlier in some cases than others. The tooth which best illustrates the process is perhaps the first mandibular molar. If the first molars be examined in their earliest stage of eruption, it will be seen, in the majority of cases, that although only just piercing the gum, they are in partial occlusion. There still remain ways by which room for the advancement of the tooth is possible. This space could be obtained by a closer adaptation of the occlusal surfaces ; by a lengthening of the ramus of the jaw and by an advancement of the mandible : we believe all these do occur. The last factor, though not yet established is, in our opinion, of importance. Yet we do not think these factors of themselves sufficient to account for the complete eruption of the teeth by advancement, and we are of the opinion that the explanation must be sought for in the denudation of the tooth by absorption of the tissues overlying it, a change which we regard as being mainly due to the functional stimulus of mastication.

"It is probable that everyone will agree that a tooth which has already perforated the gum is further exposed by the absorption of the tags of gum overlying it. We would like to point out that if this process be continued until the loose flaps of gum are removed down to the neck of the tooth—leaving the gum closely attached to the periodontal membrane, with its free margin protected by the bulge of the tooth above it—the state of complete eruption is reached. The difficulty of determining the conclusion of this latter stage is considerable owing to the long period of time occupied even in healthy mouths. In unhealthy mouths, as in the case of

the incisors in mouth breathers and other conditions of impaired function, the change is much prolonged. Some cases, indeed, would appear to remain in a state of incomplete eruption almost indefinitely. This is particularly so where a condition of so-called 'pyorrhœa' becomes established, as this affection is undoubtedly liable to occur in mouths where the absorption is incomplete."

The discussion upon this paper should give rise to criticism of the views expressed in these quotations, particularly as far as they affect the line of treatment I am advocating for those cases in which vertical development is deficient and a too close bite results. A mandible in the post-normal position causes the occlusion of the molars to occur prior to their full vertical development. This is well demonstrated by advancing the mandible to the correct position, when a considerable space is present between the occlusal surfaces of the respective molars of the mandible and maxillæ. The stage of eruption of the molars during which the tooth with the surrounding tissues approaches those of the opposite jaw, and which should permit of full development, is restricted to the limited vertical space resulting from this postnormal position. The denudation stage of eruption leads to exposure of the crowns of the teeth, whilst complete eruption in most cases never occurs. Tags of gum may remain upon the teeth for long periods, caries is frequent, mainly because food collects easily, but also because cleansing by mastication, with the tongue, or by artificial means is difficult and imperfect.

It will be generally admitted that postnormal occlusion and mouth breathing are almost constantly associated, but it is well to emphasise that there are some who keep their lips apart although they do not breathe through the mouth. The important factor is that the jaws are apart during the greater part of the twenty-four hours.

The importance of heredity in these cases must not be overlooked, although it is difficult to do more than note that similar conditions are found without doubt in parents and children, and that many in one family may be affected; in spite of this, a common factor may be the cause.

Examination of patients, or of models in which the bite is too close, shows the crowns of the molars imperfectly exposed, whilst the mandibular incisors have an elevated appearance and those of the maxillæ frequently protrude. If the occlusion of the jaws be examined, the mandibular molars and canines are nearly always postnormal, whilst the incisors are generally in contact with the palate. If the mandible is advanced so that the incisors bite as near as possible into the normal position a considerable gap exists between the teeth posterior to the canines. The establishment of the mandible in this position, with alteration of the relationship of the teeth, is what should be aimed at in the treatment of the majority of these cases.

It is of interest that advancement of the mandible with the eruption of the third molars has been described. At the Royal Dental Hospital, I remember Mr. Leonard Matheson describing some cases, one a member of his own family, I believe.

The method adopted in order to bring about a fuller development in the molar region, consists of the introduction of a vulcanite plate, which removes the bite entirely from the molars by capping the maxillary temporary molars or premolars, as the case may be, and by means of an inclined plane which engages the lower incisors

and compels the patient to bite in the forward position only. A lower plate may be used at times. The technical details comprise a plaster of paris impression, a wax bite-plate made to cap the temporary molars or premolars, and with an inclined plane for the incisors to bite upon. Previous to taking this bite, the patients must be shown the exact position in which the teeth are to be placed together. This is best done by asking them to bite the front teeth together and then to slide the lower incisors inside the upper ones until the corrected position is obtained. When the wax bite-plate is introduced, the correct position can be obtained without any difficulty, although one or two attempts may be needed in some cases. The wax, trimmed up and corrected for vulcanising, may be tried again, but usually it is unnecessary. Wax may be added in order to depress one or two of the mandibular incisors which usually need correction, and grooves cut on the inclined plane in such a manner that a lower canine may be directed forwards and outwards. In the majority of cases a jack screw is inserted, the form introduced by Mr. Badcock being by far the most useful; a second guide should be added in order to strengthen the plate. This is particularly necessary when the halves of the plate become widely separated. (The Dental Manufacturing Company are making a jack screw after this pattern.)

The particular details in each case can be readily determined by the operator, the variation depending upon the type of case and the age of the patient. The earlier the correction can be effected the better for the subsequent development of the jaws, as the normal development is more closely approximated.

Much nonsense has been talked about the impossibility of effecting changes in the temporo-mandibular articulation, as if the adult joint existed in the infant. The development of the joint must be influenced if the occlusion be altered in infancy, but the later in life the attempt is made to correct a postnormal occlusion, the more necessary is it to adapt the procedure to the established conditions.

Although it is not my intention to deal with the subsequent treatment, I have found one procedure exceedingly valuable. When the condition of open bite has been established in the incisor region, if the teeth are spaced, or in a patient in which the extraction of the first premolars has been necessary, an arrangement is made by means of which rubber dam can be used at night, stretched from hooks attached to wires on the first molars of the retention plate, or even, at an earlier stage, from the vulcanite overlapping either the temporary molars or premolars (see figs. 16 and 17).

A slight difficulty occurs at times in keeping the plate in position, particularly when the temporary molars are shallow; assistance is obtained by relieving the plate over the cusps of the teeth either by a thin layer of metal prior to vulcanising or by drilling the vulcanite away afterwards. At times a metal crib can be used in place of the overlap of vulcanite on the second temporary molars. Any particular case can usually be met by a special device which will suggest itself to the dental surgeon. The notes attached to the illustrations should make the chief points clear.

The PRESIDENT said Mr. James's paper was an interesting one on a subject which was constantly presenting itself in the treatment of orthodontic cases, and, as Mr. James said, the condition was one which was only associated with post-normal occlusion, especially in those who were mouth breathers.

Dr. SIM WALLACE said he was fully in agreement with almost all

that Mr. Warwick James had said, and he believed that in one of his own prehistoric papers he spoke of the muscles pulling back the jaw and preventing the proper growth. He did not exactly like the way Mr. Warwick James put the matter when he said that the mandible was displaced backwards, because he did not think it was displaced backwards; it was the action of the muscles pulling it backwards which prevented it growing forwards. The growth of bone at the posterior border of the ascending ramus of the jaw would grow forward. In some things, however, he was not quite prehistoric, and he had brought forward another little thing which he thought added to the knowledge of the etiology of the subject; it was with regard to the occlusion of the incisors at a very early age. Mr. Warwick James had shown that the development of the bone might be stimulated by a continual bringing forward of the lower jaw by a vulcanite plate, but there was another way whereby the growth forward of the jaw could be stimulated, and that was by the constant apposition of the lower incisors with the upper incisors in the act of gnawing. Although Mr. Warwick James said the deviation could be detected at 2 years of age or even earlier, he himself believed that in a proper case it was visible practically immediately the teeth were erupted. In a very early case he had watched the incisors coming up into position, and instead of the child gnawing he held his mouth open and by the time the incisors had erupted the bite was close and the lower incisors were up against the gum. The first thing that brought about normal occlusion, he considered, was the constant apposition of throwing forward of the lower jaw to gnaw.

Mr. POLLITT, referring to the case which Mr. Warwick James had treated at 2 years of age, asked whether the treatment would be the same in the case of a normal mouth breather and also whether the child wore the plate at night and whether there was any difficulty with regard to the wearing of the plate, difficulty especially in eating.

Mr. HIGHTON asked whether Mr. Warwick James used the expansion screw in conjunction with the vulcanite plate and, if so, whether there was not a danger of expansion in the upper molar region.

Mr. PITTS said that, interesting as were the results which had been brought forward, he thought the views concerning the etiology of the condition were even more interesting. Mr. James had quoted some earlier papers in which he mentioned that certain changes occurred in the jaws of children and on that based certain inferences. He remembered at that time being closely associated with him at the Hospital for Sick Children, and the matter being very frequently pointed out, and also remembered Mr. James speaking of the spreading of the incisor teeth and also of the attrition and change in the relationship of the mandible to the maxilla. He had often verified these observations since and was more than ever convinced that they were correct and had not received the attention of the dental world that they deserved, but he was not at all sure now that he was prepared to place the same inference on those observations as he did when he saw the cases with Mr. James. It was quite true that in the majority of children attrition occurred, and he himself regarded that as being a sign of normal growth, together with spacing, but with regard to the movement forward of the mandible he would like to ask whether it was really so. It was quite true that if a child of five, in whom attrition was well marked, so that most of the overlapping of the upper incisors had been obliterated, were asked to bite, the bite would nearly always be edge to edge, and there would be in that case a perfectly good molar occlusion, but by perseverance one could always get the child to close back into the original bite—using the term “bite” as indicating a static anatomical relationship of the lower jaw to the upper jaw, which occurred in mastication and which was practically, although not quite, the most posterior position which the mandible was capable of assuming. That normal bite, even although the attrition was well marked, could be still assumed by the child. The edge to edge bite was a functional condition due to the forward movement of the jaw in mastication.

He did not think that actually there had been an alteration in the anatomical relationship of the mandible to the maxilla, as Mr. James would seem to suggest. With regard to eruption, he agreed fully with the paper Mr. James had quoted, but found it difficult to understand how one could get an insufficient vertical development of the molar teeth and yet have complete denudation occurring. It would appear, according to Mr. James, that there was an imperfect eruption of the teeth with regard to the bone, although denudation had gone on. He himself had seen many cases where denudation remained imperfect, as he believed it did nearly always in the case of the third molar, but he did not see how it was possible to get complete denudation and yet still have an imperfect relationship with regard to the bone. He would like to know whether Mr. James thought there had been an alteration in the relation of the condyle to the glenoid fossa. Did the relationship remain unaltered or did Mr. James think that the patient had assumed a functional bite of convenience, the anatomical bite still remaining and being assumed on occasion? He thought it was rather important, in connection with results which were obtained, to determine really what had happened.

Mr. FRIEL said it had occurred to him that in two cases he had treated by jumping the bite he had done exactly what Mr. Pitts said, namely, he had got two bites, a bite where the child could bite forward with a beautiful result and a bite with a frightful result. In Tomes' Anatomy, the second edition, there was a jaw of the skull of a man who had a few upper incisors on one side and a few lower incisors in the lower jaw on the other side, and to get those few teeth to approximate he had to shift the jaw to the other side. He had a flat glenoid fossa. Possibly that was what he himself had produced and possibly what might be produced in some other cases of jumping the bite. He thought in treatment it was absolutely essential that a plate should be worn continuously before the proper condition could be obtained, and he would much prefer to fix a biting plane that was attached to the tooth and that the child should continuously bite in the one position shown in the model. The change that was going to occur was very large, and he thought it would have to be a very continuous bite if it was going to occur at all. Either the ascending ramus was going to change or the neck of the condyle or the bone that surrounded the joint. The joint itself was not likely to change. He had brought a model showing the biting plane used by Dr. Johnson in Boston. It was attached to the molars. Dr. Johnson made two upper molar rings and soldered two horizontal lingual tubes to the rings and fixed a longitudinal arch. To that lingual arch was soldered a small oval piece of wire with a flat surface, and the lower teeth had to bite on to that plane. That allowed much more freedom than a biting plate; it did not interfere anything like so much with function and was much more constant. His great objection to the biting plates was that sometimes they were worn and sometimes they were not. With regard to the etiology, in his own practice the worst cases of close bites were not mouth breathers, and he thought it was quite true that they were never mouth breathers. He had two models of children of 4 years of age. The parents said that they were not mouth breathers, but they had very close bites. It was true that in the majority of cases there was distal relation of the jaws, and in those two cases the distal relation was on one side only. In actual treatment there was a difference between cases of mouth breathers and cases not produced by mouth breathing. In the latter cases one might obtain a result, but it was much more difficult to maintain it. In the case of mouth breathers the result could be obtained and maintained. Neither of the cases he showed had any protrusion, and they were not mouth breathers. In cases of mouth breathers he had found that the lip pressure was very reduced. He had been using an instrument by which he could measure the pressure of the lips, and in cases of mouth breathers it was very much reduced, and in both of the children he had spoken of, the muscular pressure

of the lips was quite good, almost a pound. In children who were mouth breathers it was very much less.

Mr. J. H. BADCOCK said that a great many years ago he used plates something like those Mr. James had described, with the inclined plane. He always used an inclined plane, with a metal surface, so that the teeth could slide upon it more easily. He found, as Mr. Friel had said, that two bites were obtained, and he came to the conclusion that the reason was that the biting plate only acted intermittently. It was not a question of leaving the plates out, which would make matters all the worse. If a plate were used like the one designed by Dr. Johnson, it was only effective while the teeth were clenched, which is seldom and for a short time only, so that an apparatus of that type was really acting only for a comparatively short period, the jaw working now in the forward now in the backward position. If one were aiming at an alteration in the glenoid fossa, some apparatus must be used which would keep the condyle in its forward position all the time, because if it were always sliding forwards and backwards a stable result could not be expected. Therefore he gave the method up some time ago. After conversation with Mr. James, he was stimulated to try it again, but he thought his results were much the same.

Mr. FRIEL said the apparatus of Dr. Johnson was only used for raising the bite, not as an inclined plane. It was not for bringing the jaw forward.

Mr. KEAG thanked Mr. Warwick James for his paper and confessed that when he read the title he was greatly cheered, because close bite cases seemed to present an insoluble problem. When he read the summary of the paper he was disappointed, because it seemed to him that it was just a particular phase of close bite. As a matter of terminology he would not ordinarily have used the term for such cases, but one got into the habit of using Angle's terminology, and he thought he would call it a case of Class II. The essential feature of the cases presented by Mr. James was hardly a close bite but rather the post-normal occlusion of the lower teeth. His own preference in the treatment of such cases was for the Angle apparatus with modification—instead of the buccal arch in the lower or lingual arch. The result appeared to be the same eventually, although got by different means. The effect of the bite-plate and the Angle apparatus was two-fold. There was probably a reduction in length of the lower incisors as well as an elongation of the molars. Certainly there was a great deal of difference in the curve of the lower arch, which he thought was not entirely accounted for by the further eruption of the molars, but was accounted for in the bite-plate by the extra pressure on the lower incisors as well as the further eruption of the molars, and in the Angle apparatus the use of the lingual arch, the pull of the elastics on the lower molars transmitted through the lingual arch, was to depress the lower incisors and also to raise the lower molars. In view of the doubt which has been expressed as to the permanence of the results, he thought the Angle apparatus was preferable. By that means the bite was not jumped at all and the progress between post-normal occlusion and normal occlusion was steady. At the intermediate stage the bite was in between. It was only when the treatment had reached its conclusion that the normal bite, the bite which the child used in the great majority of occlusions, was the bite in which the incisors and molars came into what was regarded as normal occlusion. There was no doubt about the permanence of the normal bite when it was reached in that fashion with an Angle apparatus, and there certainly seemed to be some doubt of it when reached by the method of the bite-plate.

Mr. HOUSDEN said he noticed in one of Mr. James's models that there was a lower incisor missing in the front, and he would like to know whether that was due to regulating.

Mr. SAMUEL said there were several points in the paper which had puzzled him. As he understood Mr. James, one of the causes of what was usually called Angle Class II was a too close bite and it was said

that that was most frequently found in mouth breathers. With regard to the question of treatment, he understood that one of the alternative treatments of Class II, Division I, cases, as given in most of the text-books, was treatment by an inclined plane and opening the bite.

Mr. SIDNEY SPOKES said he had been very interested not only in the paper but in the discussion, and had been also a little perplexed. He had tried to follow the various speakers in the different ways in which they diverged from Mr. James's paper, and they seemed to go very far afield. If the paper was taken without any of the frills which had been added to it, it was quite a simple thing. There was a bite with the lower incisors biting on the upper gum: leave the etiology out altogether and have regard simply to the treatment. A very old method of treatment was to raise the bite and give the molars an opportunity of rising, and he had seen it done over and over again. He quite agreed with one speaker that while the molars were coming up the lower incisors would be pushed down, but even that was not a disadvantage. He would content himself by saying that he could accept what Mr. James had put forward in the first place.

Mr. F. B. BULL said the question was whether the bite, when the case was finished, was a stable one. On one occasion when a child was asked to occlude, the bite appeared as shown in the finished model, and at other times, when the child was not being watched, there was a tendency for the jaw to be drawn back again. If the patient's bite was well forward, and that was not really the true bite, the muscles after a time would have a tendency to get tired, and if the child was asked whether those muscles ever did have a tired feeling it would be almost a solution to the mystery. He did not know whether Mr. James or anyone who had treated cases in that fashion had ever asked their patients the question.

Mr. WARWICK JAMES, in reply to the discussion, said he had certainly aroused some interest, if nothing else. He had read a great deal of what Dr. Sim Wallace had written, and it was always well worth reading. It was surprising how much Dr. Sim Wallace had taught orthodontists. With regard to the backward displacement, he had said in that paper that it could be called a backward displacement, but was probably more correctly described as a want of advancement, so that he should be in agreement with Dr. Sim Wallace there. He was sorry to claim to be the first person to regard the weight of the tissues upon the mandible as the factor which prevented that advancement, and he apologised for not having recognised that point in Dr. Sim Wallace's literature. Stimulation by gnawing was a point to which Dr. Sim Wallace attached great importance, and there was little doubt of its importance, but in these cases it was a fact that the jaws were apart rather than closed. The mandible was brought forward in order to gnaw. If the jaws were apart the weight of the tissues below acted upon it and tended to maintain it in a backward position. Mr. Pollitt had asked whether the plate was worn at night. The actual plate shown had no inclined plane upon it; it was used merely to open the bite to allow the temporary molars to rise. The child wore the plate night and day and during meals, and had no difficulty in using it; in fact, the child said he had the plate given to him because he was a good boy, and regretted very much giving it up. With regard to the use of the Badcock screw when capping the premolars, it was necessary to see that the expansion was not carried too far. He did not think it mattered a great deal if the teeth were a little over expanded as long as they were not carried out far enough to lock outside those of the mandible. They would drop back quickly enough if given the opportunity. If expansion was unnecessary or only slight expansion was needed, a bite-plate alone could be put in and the molars allowed to rise. He was not dealing with the question of the correction of a general irregularity but merely talking of the use of a bite-plate in order to elevate the molars and get further development of them. It was quite true, as Mr. Pitts had said, that different bites could be assumed. It depended on the age of the patient. If the patient's

joint was incomplete in development as when a commencement was made with a child of 2 years of age, the development of the temporo-mandibular joint could be influenced. Starting with a patient of 20 he had been able to raise the bite and get results.

If the maxillary arch was expanded and the molars allowed to develop, the mandibular arch could only occlude in the forward position and if the expansion were maintained the child would assume that position. All the teeth at first might not be occluding correctly but in due course they would do so if sufficient space was allowed for their development. It was necessary to maintain the maxillary arch, and in order to do that he let the children wear a vulcanite palate for several years, gradually dropping it, wearing it by night and not by day, or by day and not by night. It was necessary to maintain the position that had been attained, or the teeth went back, and that was why he thought the use of the inclined plane formerly failed. He did not think the capping of the premolars or temporary molars when an inclined plane was used formerly was done intentionally; he thought it was largely done by chance. By using an ordinary Coffin expansion plate in the case already described, the result was absolutely astounding. It was true that the mandible often had a great deal of movement if the patient was over 12 years of age when treatment was commenced, and that was why he urged that cases should be attempted at 2, 3 and 4 years of age, as soon as the temporary teeth were in position. It is quite possible that the eruption of the first permanent molars may become the ideal period to undertake treatment. He quite agreed with Dr. Sim Wallace that as soon as the temporary teeth were in position one could recognise the position that was going to be taken up, and he believed that treatment should then be attempted. With regard to Mr. Pitt's remarks on the subject of denudation and imperfect eruption, in his paper on eruption he pointed out that the tissues grew and that the teeth were carried with all the tissues into position, and that if a mouth was examined where the tissues would eventually be normal or even abnormal, the gum tissues were often in contact prior to eruption (see fig. 2). The first permanent molars almost immediately they pierced the gum were very often actually in occlusion. He had seen cusps of opposing molars within a millimetre of one another at the time of actual eruption. In the process of eruption growth took place and carried the teeth with all the tissues upwards or downwards, as the case might be. Denudation continuing under such conditions would leave those teeth exposed, and if the occlusion occurred too early the teeth would be left in a position of insufficient development. With regard to the wearing of the plate, he told the patients that if the plate was not worn he would not go on with the treatment; that if they would not wear the plate, it was not the slightest use going on. He found patients would wear the plates and continue to wear them. Occasionally there was a case where a child would not, and then if treatment had to be gone on with, a fixed appliance should be used. He used a fixed appliance in some of the cases after he had raised the bite, possibly using a fixed appliance in the mandible and a vulcanite palate to keep the position in the maxilla. With regard to Angle's apparatus, it was the difficulty he had with patients that led him to adopt the vulcanite plate. There was always the difficulty of dealing with children who were going away to school, and he found the method he had described an exceedingly simple one, and he believed it would not be long before a great many orthodontists were using it, on account of its great helpfulness. It saved a long period of time during which the relationship of the molars could be altered, and then other apparatus could be used that involved more time and care. With regard to Mr. Samuel's remarks, it was perfectly true that the inclined plane was mentioned in the text-books, and many dental surgeons had used it, but he thought the rather prolonged use he had adopted was a modification of the method. He had had no intention of reading a paper on the subject until he was more or less urged to do so, feeling that it was an important modification that might be discussed by the Society. He did not know

how far the muscles became tired. The thing was to provide a bite that a child could adopt. With a vulcanite plate such as he used for a child of 2, in eating its food it could only bite on the plate, and the position was actually assumed. He did not attempt really to jump the bite, because he did not think jumping the bite was the correct treatment. He simply raised the bite allowing development of the molars in a vertical direction. Some of the cases were so bad that the protrusion of the upper incisors could be very unsightly and difficult to deal with, and in those cases he always used a rubber dam at night with the plate that he used for fixing, so that the teeth could be pulled back quite quickly. Very often the occlusion was fixed and the bite was open anteriorly, and in such cases he had extracted the first premolars and gone on pulling the teeth back until they dropped down on the lower incisors. The modifications that could be adopted with this particular method were numerous. If the bite was propped open, the teeth were protruding, the length of the face was altered, and the incisors were pulled back until they came back on to the lower incisors. It was a fairly simple method. In hospital practice such a plate could be worn and the teeth corrected in that manner,

The PRESIDENT thanked Mr. Crane and Mr. Steadman for their Casual Communications and Mr. Warwick James for his paper.

AN Ordinary Meeting of the British Society for the Study of Orthodontics was held at 11, Chandos Street, Cavendish Square, London, W., on Monday, November 7th, 1921, at 8 p.m., Mr. J. LEWIN PAYNE, President, in the chair.

The minutes of the previous meeting were read and confirmed.

The following were duly elected as members: Mr. W. T. Clarkson Webb, L.D.S.Eng.; Mr. Harold G. Watkin, L.D.S.Liverpool; Mr. J. Snarey Wright, H.D.D.Edin., L.D.S.Eng.; Mr. E. H. Bryant, L.R.C.P.Lond., M.R.C.S., L.D.S.Eng.; Mr. A. Ll. Spencer-Payne, M.R.C.S., L.R.C.P.Lond., L.D.S.Eng.; Mr. E. R. Bailey, M.R.C.S.Eng., L.R.C.P.Lond., L.D.S.Eng.; Mr. Conrad A. Achner, L.D.S.Eng., Ph.D.Bern.; Mr. Alfred Jameson, L.D.S.Edin., D.D.S.Penn.; Mr. J. T. Jameson, L.D.S.Edin.

Mr. G. F. CALE-MATTHEWS read a casual communication:

“A new Molar Band and its application for Buccal and Lingual Arches.”

This band is evolved from the experience that we all have of the difficulty of adapting a plain soldered band to a molar tooth with anything like a firm and secure fit and lack of irritation to any of the soft tissues. I have it made in two thicknesses—one 1/7,500 and the other 1/10,000—and in ordinary light lingual arch attachments I find that the 1/10,000 is quite strong enough, and it is very malleable and easily adjusted. The main parts are these. It consists of a band with a tiny tube and a female screw attached in the ordinary way, and the female screw is rounded at the end, and the bolt is very fine, with a very fine screw. I cannot give you the number of threads to the inch, but it is extremely fine; and that is quite separate. It is turned up with a watch-key wrench or spanner such as we use with the Lennox matrix. That is its great usefulness, because you can immediately see that in applying the band with the screw on the buccal side of the tooth you are working away from any soft tissue, and it is working very well with the Lennox type of spanner. The other point is that owing to the fineness of the screw it may be placed very low on the molar tooth; consequently it grips well a very shallow lower molar, which is often an extreme difficulty, as I think we all find in dealing with small teeth. You may use it with any type of

appliance you like ; you may have it with buccal tubes for the ordinary buccal arches, or you may have it without a tube for the application of any lingual appliance, and if the tooth is high enough you may also use a buccal appliance in conjunction. There is another little usefulness ; it may be used interstitially in this sense—that you may have your nut and bolt on the mesial surface of your molar when you have a place, as you frequently have, when a second bicuspid may not have developed. You may have your attachment there, and so utilise a buccal and lingual arch. There are tremendous difficulties in getting anything of this description manufactured, and the slides which I shall put before you to-night, I think, will be the easiest method of demonstrating anything.

[Slides were then shown.]

The alignment of the screw is also made at 80 degrees, or 10 degrees off the horizontal, which enables it to be used for buccal arches in the mandible and is thus easily screwed up as shown on slide.

Mr. HIGHTON asked Mr. Cale-Matthews whether he had had the band manufactured, and if so, where it could be obtained.

Mr. HAROLD CHAPMAN said that he had had an opportunity of glancing at the band which Mr. Cale-Matthews had shown to the meeting, and the great point about it which struck him was the smallness and neatness of the clamping mechanism. It seemed extraordinary, when such a neat little affair as that could be turned out, that dental surgeons should have gone on with the type of clamp band which they had used for so many years, and that no one should have thought of reducing its size. The only criticism that occurred to him was whether such a fine thread would stand very much strain. He would like to know whether Mr. Cale-Matthews had had any experience of that, or whether he was particularly careful not to strain the threads on the wire when tightening the band. It also struck him as a great advantage to have the mechanism soldered on at a slight angle, as had been so clearly pointed out on the screen, especially for use in the lower jaw, where the tightening could be facilitated very much. It seemed to him (the speaker) that the band would fill a gap among dental appliances which had long needed to be filled.

Mr. G. NORTHCROFT asked whether Mr. Cale-Matthews would go a little more fully into the application of the lingual arch. He had not quite followed whether it was Mr. Cale-Matthews' custom to solder the lingual arch on to the bands and then take off the band every time he wished to readjust the lingual arch, or whether he used some form of movable attachment on the bands.

Mr. SIDNEY SPOKES said he had been very pleased to hear an appreciation of the Lennox outfit. Many present would remember Mr. Lennox and what a boon his matrix had been to so many practitioners ; but it seemed to him that perhaps in addition to using the flexible watch-key which Mr. Cale-Matthews had mentioned it might be possible, in order to get a better fit of the band in certain of the cases, to have the band cut as a Lennox matrix, a segment of a circle. It seemed to him that instead of getting the straight band with the clamp, one would be able to get an accurate fit with a Lennox matrix band. Very likely that had occurred to Mr. Cale-Matthews ; but he thought that one might go a little further in the Lennox outfit and employ the band as well as the watch-key.

Mr. CALE-MATTHEWS, replying to Mr. Northcroft, said he would infinitely prefer to remove the lingual arch and readjust it. As he had endeavoured to explain—one made a bed for one's appliance before one put it into the mouth at all—composition was quite good enough—and that was always kept, and always gave one the correct original relation of the molars ; so that one could always avoid expanding the molars, and when the arch was taken out one could be quite sure that when it was applied there was no great force on the molars. He infinitely preferred to remove the whole thing and readjust it—expand it or make any other necessary movements, and polish if

necessary. At fortnightly intervals that would not result in any harm to the enamel, even if cement were not used.

The point raised by Mr. Chapman with regard to the wear of the thread of the screw was one which was naturally one's first thought; but he had found that the thread, fine as it was, would stand a very considerable amount of strain. The head of the bolt would distort before the thread would give way, as he had found in actual practice.

Mr. SIDNEY SPOKES read a casual communication :

"Supplemental Teeth."

I have been looking over some old models, and it seemed to me that two of them were such that the Curator of your Museum might like to put away. Of course, supplemental or supernumerary teeth are fairly common—supernumerary teeth of various shapes and sizes and bad positions; but when they take up a fairly good position in the arch and look like teeth, then I think we generally call them "supplemental" teeth to a series. These models both show six incisors in the upper jaw, three on each side; first, second, and third, which we used to be taught represented the "typical mammalian" dentition so far as the incisors are concerned. The one shows the three incisors in very fair position; they are well-shaped teeth on each side, but have shut out the erupting canines. The other model shows also six incisors. In this case the third is erupted inside the arch, and the canines have come down. I am sorry I have not the history of these cases, but part of the history of one of them is revealed by the fact that I apparently removed the two supplemental incisors in that case, because they are now appearing in the model, and the canines are in fairly good position. *This* is evidently a much older patient than the other one, because apparently the first molar has been removed on each side, and the third molars are in position. With regard to the treatment which this Society might recommend, the second one I have already dealt with by extracting the supplemental teeth; but I imagine there would not be very much difference of opinion in suggesting the extraction of the supplemental teeth in the first model.

Incidentally I might point out that in the older patient's model hypoplasia is illustrated, the pitting of the enamel of the teeth extending even as far back as the first bicuspid; both the canines and also the supplemental incisors are affected.

Mr. GEORGE THOMSON mentioned a case which he had had about thirty years ago, of a boy who had a central incisor—he thought it was the left one—kicked out by a horse. He came straight to him (the speaker) at the Melbourne Hospital; he had a supplemental lateral on the other side. He removed that and implanted it in the socket of the missing one; it was seen after three months doing well.

THE IMMEDIATE TORSION OF INCISOR TEETH.

F. BOCQUET BULL, L.R.C.P., M.R.C.S., L.D.S.

I AM reading this paper to you this evening with the hope that perhaps the results of eight cases of irregular teeth treated by immediate torsion in the Dental Department of Guy's Hospital may be of interest to you.

The practice of immediate torsion dates back as far as I can find for many years. Tomes in his "Dental Surgery" mentions a case reported in the "Transactions of the New York Odontological Society for the year 1875" of a right supernumerary tooth twisted by immediate torsion. The details of the operation of immediate torsion are given by him in his "Dental Surgery," as well as by Colyer in his "Injuries and Diseases of the Teeth." Bennett's "Science and Art of Dental Surgery" also gives valuable information on the subject.

In this country the operation of immediate torsion has been practised by Dolamore and Spokes. Apart from these surgeons, I have not been able to trace others who have adopted it on any extensive scale, and apparently it is but little practised, if at all, at the present time.

A rotated tooth may be moved by one of two methods, viz., by slow torsion or immediate torsion. There may be many of you here to-night who would say, "Why take the risks of the operation of immediate torsion, viz., killing the pulp, fracturing the tooth, causing necrosis of the bone around the tooth with subsequent loss of the tooth, when you can obtain the requisite result by slow torsion without any risk whatsoever?" To those of you I would say that, if your cases are selected carefully, the risks alluded to are largely illusory, and, on the other hand, the time and labour saved both to you and your patient are very considerable.

The tissues involved are numerous, consisting as they do of the pulp, dentine, cementum, periodontal membrane, bone, and to a minor extent, the overlying gum. Of these, the part most likely to be damaged, as one would expect, is the all-important one, the pulp.

Modus operandi.—It having been decided that the tooth under consideration should be rotated by immediate torsion, and here let me state that, as in all other operations, the slight risk in connection with it should be pointed out to the parent or guardian; two sets of models should be made, one for the purpose of record, and the other for the purpose of splint-making.

The making of the splint needs careful consideration, as upon this greatly depends the success or otherwise of the operation. Personally I like to make an anchorage of two teeth if possible, although one tooth will suffice. The anchor teeth need not necessarily be upon both sides of the tooth to be rotated. The first step is to carefully remove the tooth to be rotated from the model by cutting around it at the cervical margin and then gently levering it off. Having done this it is replaced in the desired position on the model by means of hard wax.

A very thin wax matrix is made covering about two-thirds of the crowns of the teeth to be splinted. Great care should be taken not to run the splint up between the sides of the teeth, or otherwise the splint will be difficult, or almost impossible, to adjust. Further, the matrix should be cleared or thinned enough on the palatal surface to prevent interference with the articulation.

The matrix is then invested in the usual way and cast in Ash's silver-copper alloy. This runs very easily, need not be gilded, and has no deleterious effect on the oral tissues.

All the cases that I have records of to show you this evening were performed under ethyl chloride. This anæsthetic, so suitable for children, gives an ample anæsthesia for the operation, including the fixation of the splint. It is advisable to have present at the operation an assistant to prepare the cement and insert it in the splint, so that after the tooth is rotated the splint is ready for handing to the operator. The instrument that has been used in all these cases is a blunt pair of upper incisor forceps.

The site of operation having been prepared by means of painting with a 3 per cent. solution of tincture of iodine, the patient is anæsthetised. When the patient is ready, the alveolus is held firmly as for the extraction of a tooth, and the instrument applied.

Frequently the instrument has to be passed up under the gum margin in order to reach beyond the convexity of the teeth, for in many cases the tooth has not erupted sufficiently for this convexity to be exposed. As soon as the instrument is sufficiently far up the crown of the tooth for a firm hold to be maintained, torsion is commenced. In many cases torsion alone will not move the tooth, and the inward and outward movement used in extraction, only with more care, is necessary as an additional help. While this part of the operation is proceeding, the assistant should be mixing the cement (in all cases Ames' oxyphosphate of copper has been used) so that at the critical moment the splint is ready to be handed to the operator to fix. The teeth should be cleared of blood as much as is possible, although from the point of view of the security of the splint on the teeth this does not seem to matter much. At first I endeavoured to remove all traces of blood, and even dry with alcohol, but not only was this almost impossible, but, as I have just said, unnecessary. The splint should be forced well on the teeth in order to adjust the rotated tooth to the position recorded on the corrected model. All excess of cement should be carefully removed, and the splint held in position while the patient is recovering from the anæsthetic. Usually two to three minutes is a long enough period for the splint to be maintained in position, as at the completion of this period of time the patient has ceased the struggling sometimes associated with recovery, and the cement is hard.

After-treatment.—It is advisable to see the patient on the following day in order to ascertain that no undue pain is being suffered, and again about the fourth or fifth day. After this, it is unnecessary to see the patient again for some weeks, if promise can be obtained that immediate notice will be given if any trouble whatsoever is experienced. All the present cases were seen as nearly as possible once a fortnight, but this was for the purposes of X-raying, and to gain experience of their progress. For the first few days it is advisable to prescribe a mouth-wash, chiefly for the purpose of keeping the mouth, and particularly the neighbourhood of the splint free from foreign material. For this purpose hydrogen peroxide of a 5-volumes strength has been used.

Removal of the splint.—The splints have been removed after an interval of about three to four months. It must be borne in mind that, apart from the use of the splint to immobilise the tooth rotated, it serves also as a protection to the tooth during the process of mastication.

Just a few more words before I commence to show you the slides illustrating the cases. Those of you who in your private practices are able to carefully preserve your models, films and records may think it perhaps rather surprising that the cases that I show to-night are incomplete to a small degree regarding these important accessories. I will ask you to bear in mind that these are hospital cases, and that models, films and records cannot be carefully locked away so that the operator can be certain that he is the only individual to use them, but that they have to be so kept that operator, house-surgeon, dressers and others can have access to them at any time, and then not in a private consulting-room, but in a room populated by perhaps 200 to 250 people, including those well-intentioned but sometimes annoying people, the hospital cleaners.

IMMEDIATE TORSION OF INCISOR TEETH.

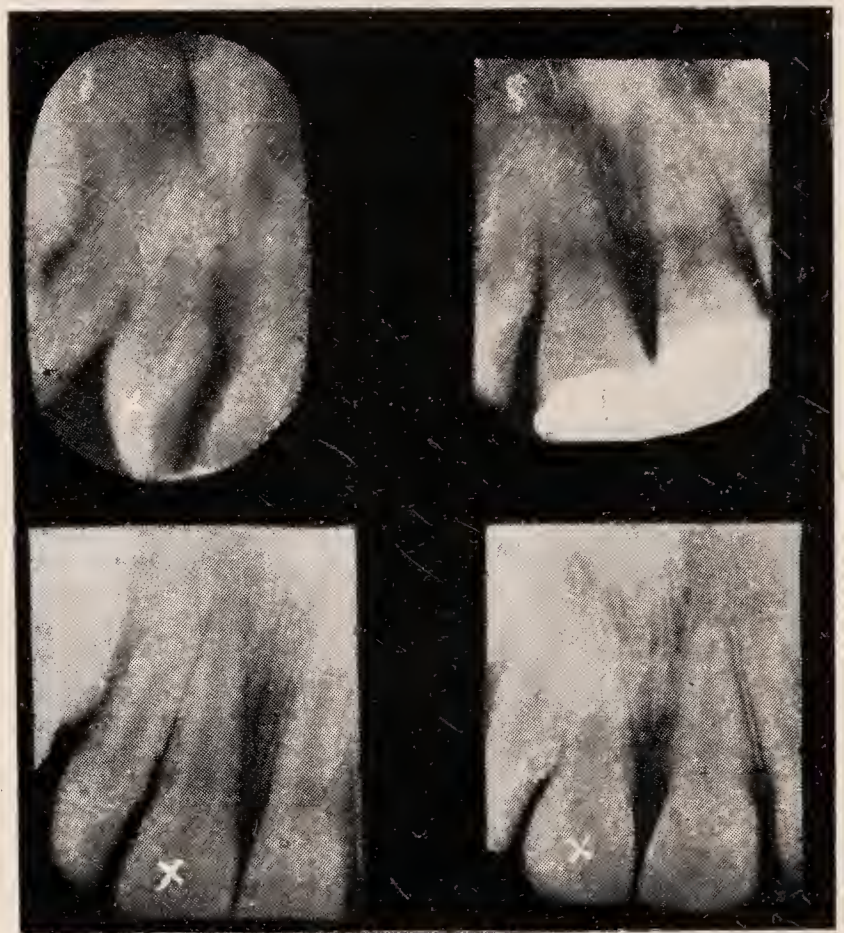


I

2

CASE I.

(The cross indicates the tooth moved.)



3

4



Illustrating Paper by
F. Bocquet Bull,
L.R.C.P., M.R.C.S.,
L.D.S.

The foregoing is a brief apology for my inability to show you the slides of one or two models and films that have disappeared during the period over which these cases extend.

Case 1. A boy, Horace L., *æt* 8 years. On October 23rd, 1920, immediate torsion of |1 took place. Condition after operation was always satisfactory. Previous to operation a plate had been inserted to retract |2 in order to make more room for rotation of |1. The tooth was tested on November 3rd, 1921, and a very good response to heat was obtained. A radiogram of the tooth taken on October 8th, 1920, showed a well-opened apical foramen, and a radiogram taken on July 6th, 1921, shows the foramen almost closed.

Case 2. A girl, Enid P., *æt* 11 years. This patient had previously had an operation for a cleft palate. She was a very difficult patient to deal with owing to marked intolerance to anything placed in her mouth. The |1 was rotated and outstanding, and the |2 instanding with but little space between |1 and |3. The |2 was extracted and 1 was rotated by immediate torsion on February 12th, 1921, at the age of 12 years, 1 month. The splint came off on February 26th, 1921, and there was slight hæmorrhage from around the tooth. On March 9th, 1921, the patient complained of slight pain in the region of operation, but this had disappeared a fortnight later. The tooth was tested later, but was found to be dead. For the reason mentioned above no films of this case were taken.

Case 3. A boy, Reginald B., *æt* 7 years, 2 months. Both central incisor teeth are abnormally large. Immediate torsion of |1 took place on December 29th, 1920. On January 22nd, 1921, the patient appeared at the hospital with the splint broken; this was refixed on January 27th. From May 1st until the middle of June the patient was in hospital with scarlet fever. On July 29th the splint was removed. On September 1st the tooth responded well to both heat and cold. A radiogram taken on November 1st, 1920, showed small development of the root, and subsequent radiograms taken until his discharge showed very well the gradual development of the root.

Case 4. A girl, Violet H., *æt* 10½ years. An upper left lateral incisor was rotated on November 18th, 1920. A radiogram taken previously showed a well-open apex. On November 3rd, 1921, the tooth was found to respond to heat, but not quite as markedly as the upper left central incisor. Radiograms taken subsequently to operation show gradual development of the root.

Case 5. A boy, Charles S., *æt* 9 years. An upper left central incisor tooth was rotated on April 23rd, 1921. The root was only partially developed. On July 12th, 1921, the splint was removed. On September 15th, 1921 the tooth was found to respond well to cold, but slightly to heat. Subsequent radiograms show gradual development of the root.

Case 6. A boy, Eric T., *æt* 12 years. An upper left lateral incisor was rotated on April 23rd, 1921. The tooth had a slightly open apex. On testing five days later no thermal response was obtained. On August 4th, 1921, the splint was removed. On

November 5th, 1921, the tooth was again tested for thermal response but none was obtained. The tooth was slightly loose, and an abscess had pointed on the gum above the tooth. Radiograms taken subsequently to the operation showed the following changes : July 2nd, 1921, a lighter area around the apex of the root denoting bone absorption, which was not shown on a radiogram taken on July 16th, 1921, but which is shown on a radiogram taken on November 5th, 1921.

Case 7. A girl, Monica L., *æt* 9 years. An upper left lateral incisor was rotated on May 21st, 1921. Great difficulty was experienced in keeping the tooth in correct position previous to splinting. The splint was removed on September 27th, 1921, when the tooth was found to be slightly painful on pressure. A counter-irritant was applied to the gum, and two days later pain had disappeared. On November 3rd, it was found that the tooth responded to heat, but not quite so well as the adjacent tooth did. The radiogram taken before operation showed a well-open apex, and those taken subsequently showed the usual development.

Case 8. Charles S., *æt* 9 years. The upper right central incisor tooth was rotated and brought forward on June 18th, 1921. On November 3rd, 1921, the splint was removed, and very well-marked thermal response was obtained. The radiogram taken before operation showed a well-open apex, and those taken subsequently showed its gradual closure.

TABLE OF CASES.

<i>Patient.</i>	<i>Age.</i>	<i>Tooth.</i>	<i>Condition after Operation</i> <i>(figures refer to months).</i>
H. L.	8	$\frac{|1}{|}$	12 Very good.
E. P.	12	$\frac{|1}{|}$	Dead.
R. B.	7 $\frac{1}{2}$	$\frac{|1}{|}$	8 Very good.

<i>Patient.</i>	<i>Age.</i>	<i>Tooth.</i>	<i>Condition after Operation</i> <i>(figures refer to months).</i>
V. H.	10 $\frac{6}{12}$	$\frac{|2}{|}$	12 Responds to heat, but not quite as much as $\frac{|1}{|}$ does.
C. SH.	9	$\frac{|1}{|}$	5 Responds well to cold, but slightly to heat.
E. T.	12	$\frac{|2}{|}$	Dead.
M. L.	9	$\frac{|2}{|}$	6 $\frac{1}{2}$ Responds to heat, but not quite as much as $\frac{|1}{|}$ does.
C. SD.	9	$\frac{|1}{|}$	5 $\frac{1}{2}$ Very good.

The conclusions that I think may be drawn from these cases are :

- (1) That an incisor tooth with a well-open apex may safely be rotated by the immediate method ; and
- (2) On the contrary, a tooth the root of which is fully or nearly fully developed should be rotated by the slow method.

In conclusion, gentlemen, I should like to render my thanks to Mr. H. M. Worth, the Dental Radiographer at Guy's Hospital, and also to my House-Surgeon, Mr. V. L. Sunderland, both of whom have given me invaluable aid in the preparation of this paper.

The PRESIDENT congratulated Mr. Bocquet Bull upon the very interesting series of models and of radiographs which he had shown.

The subject of the immediate movement of misplaced teeth was one which, as Mr. Bocquet Bull said, had interested a certain number of dental surgeons for many years; in fact, he thought one might go back even further than the author of the paper had suggested, for one found that no less an authority than the French dentist Fauchard left it on record that in 1728 he performed the operation of luxating an incisor tooth into line. Some years ago he (the President) was encouraged to do the operation known as alveolotomy through the successful efforts of Mr. Sidney Spokes and Mr. Dolamore in the immediate movement of teeth, and whose work was published in the Transactions of the Odontological Society many years ago. Alveolotomy was different from the operation of immediate torsion to which Mr. Bocquet Bull had referred; but the dangers and risks involved in the immediate method were perhaps somewhat similar to those which the author had mentioned; though for his own part he was of opinion that the risk of failure in alveolotomy was less than with immediate torsion. It would be remembered that the term "alveolotomy" was given by Mr. Dolamore in the year 1899, when he read his paper on the subject before the Odontological Society; the operation consisted in dividing the bone on either side of the misplaced tooth and in bringing that tooth into the normal line of occlusion. Mr. Bocquet Bull had referred to several of the important points to be borne in mind when undertaking such an operation as immediate movement, and he (the President) wished to emphasise the great importance of asepsis in such cases—asepsis, that is, as far as it was possible to obtain it for operations in the mouth. The value of radiographs both before and after treatment was recognised by all who adopted these methods. In the operation of alveolotomy he had used the small alveolar saws which could be purchased from the depôts, and for the movement of the tooth itself the forceps known as Grever's forceps. With those forceps he had employed a rubber pad to safeguard the tooth, so that it might not be forcibly moved out of its socket. He wished to ask Mr. Bocquet Bull whether he used some sort of pad as a protection against this mishap. Mr. Bocquet Bull had referred to one particular case in which that tendency had arisen. It had been suggested by some authorities that bony union did not occur in the maxillary bones after fracture; but for his own part he could not understand why the structure of the maxilla should be an exception to other bony structures. Of course, if the periosteum was torn and was allowed to remain between the fragments, then that would prevent union. He thought that the subject which Mr. Bocquet Bull had introduced was a field of surgical treatment of which the possibilities had not yet been exhausted and one which was worthy of further investigation.

Mr. F. St. J. STEADMAN, in thanking Mr. Bocquet Bull for his paper, said that he felt very serious doubt as to whether immediate torsion was justified or not. Certainly in cases over ten years the percentage of dead teeth that had been obtained was too high. Dead teeth, to his mind, were a very serious matter indeed, and in one case quoted this evening in which, after some months, Mr. Bocquet Bull removed the splint and found the tooth still tender, in his (the speaker's) experience, that tenderness remained. If the tooth remained tender for months while the splint was on, that would mean that the patient would subsequently avoid biting on that tooth, and periodontal disease would be set up. In that case he would feel justified in removing the tooth even after the trouble that had been taken to put it into the correct situation. Then with regard to the earlier cases, the driving of forceps up underneath the gum, right through the attachment of the gum to the alveolus into the dental ligament was an undesirable thing. The dental ligament would have been damaged, and sepsis liable to set in there; therefore he did not think the risk was justified. The tooth could be got into its normal situation by the slow method, and he felt that if it were intended to do the

operation by the quick method, one should have exceptional reasons for so doing. The risk was so great that, while thanking Mr. Bocquet Bull for his paper, he personally would not follow the practice which had been indicated.

Mr. GEORGE NORTHCROFT said he would like further information on a point raised by Mr. Steadman with regard to the risk of the dental ligament owing to the forceps having to be placed high up on the tooth. He took it that Mr. Bocquet Bull did not place the forceps any higher than on the neck of the tooth, which was enamel; and therefore he did not quite see where the dental ligament came in, which was surely connected with the root of the periodontal membrane.

Mr. E. B. DOWSETT said that the President had rather cut the ground from under his feet, because he had brought with him a rather ancient book, from which he wished to read a short extract. The extract was as follows:

“Some dentists have recommended in cases of this sort, when the space between the adjoining central and lateral incisor is equal to the width of the deviating tooth, to turn the latter in its socket with a pair of forceps. It is scarcely necessary to say, that if a tooth is turned in its socket the vessels and nerves from which it derives its nourishment and vitality are severed, and though its connection with the alveolus may be partially re-established, it will be liable to act as a morbid irritant.”

That was written in 1852 by Mr. C. A. Harris. He believed that that was as true to-day as in 1852. It was obvious that in cases after the apex was closed the pulps died, and therefore, as Mr. Bocquet Bull had said, such treatment could not be attempted; but even in the earlier cases, where the pulp still remained alive, and where, necessarily, one formed a dilacerated tooth, that portion of the periodontal membrane which was there at the time of the operation must necessarily be degenerated, because its tissues were severed. Therefore one would like to see records of the cases Mr. Bull had dealt with in the last year or so not in 1921, but in 1941, and then one would perhaps know more how to deal with such cases in one's private practice. He was strongly of Mr. Steadman's opinion, in that he did not propose to adopt the practice amongst his own private clientele, as the risk was undoubtedly far too great, and such risks ought not to be run. He had now reached the stage of being old enough to see cases that he had regulated as long ago as twenty-five years, where pyorrhœa had undoubtedly been caused by the regulation performed—and he did not think that he regulated them any more violently than anybody else. He had seen cases in the last few years of grown-up men and women whose teeth he had regulated as children, and they had developed pyorrhœa. He had kept observations upon them during the whole period. He would like to hear the views of members of the Society as to whether they had had experience of similar cases, where the patients had grown up. He thought that such treatment as Mr. Bocquet Bull had described, which was very forcible, was of such a nature that it would be very valuable to have cases definitely recorded at periods of five, ten, fifteen, and twenty years hence. At present he was not at all satisfied that one should run the risks involved in the immediate movement of teeth.

Mr. A. T. PITTS remarked that there was one name which Mr. Bocquet Bull might have referred to in his short historical resumé—namely, that of Mr. Hopewell-Smith, who frequently used to move teeth by immediate methods when he (Mr. Pitts) was house-surgeon at the Royal Dental Hospital. In contradistinction to Mr. Dolamore's method, Mr. Hopewell-Smith used to say that he always made a greenstick fracture of the outer alveolar plate. Since he (the speaker) had seen the cases which Mr. Bocquet Bull had shown the Society some time back, he had been stimulated to do a few cases himself, and so far—though, of course, these were very early days—the results had been satisfactory. With regard to what had been said about the

possibility of injury to the dental ligament, that was a point to which he had always paid special attention, and he did not think the forceps could be allowed to go even up to the neck of the tooth. He took an absorbent napkin and padded it between the blades of the forceps, so that the cutting edge of the tooth really rested on that pad, and the blade could not extend more than three-quarters of the way up the crown of the tooth. Although that necessitated a little more force on the tooth, it could be done, and during the whole of the time the forceps did not actually touch the gum margin. That certainly eliminated one possibility of infection and injury. Again, the cases he had done had been usually performed under a local anæsthetic, although in the cases of very young children probably ethyl chloride would be better.

He had been interested to hear Mr. Bocquet Bull's figures with regard to the age of the children. There was no doubt, of course, that the open apex afforded the better chance, but he wondered whether in doing that one might not cause a dilacerated condition of the tooth. It might not matter, perhaps, if one did, though if the tooth afterwards required treatment for caries it might provide difficulties for the operator. He had seen a case recently which had been done many years ago, but in that case the pulp had died, and the tooth had discoloured very markedly. There was no doubt that in order to arrive at correct conclusions one must, as had been said, have a long series of cases recorded over a very considerable period, because if there was any real risk of the pulp dying, or of the tooth remaining permanently loose, it was obvious that the operation was not justifiable; but for himself he was not prepared to take up the trenchantly denunciatory attitude of Mr. Steadman, and he actually proposed to do some more of such cases. One point which was worth laying stress upon was that the splint ought to be very thin, because it needed frequently some adjustment in the mouth, which could be done quite easily with forceps, whereas if the splint was at all thick it became difficult. It was not always possible to alter the position of the tooth on the model and to ensure that the tooth should accurately correspond with the tooth on the model.

Mr. J. H. BADCOCK said that as Mr. Dowsett had asked for the experience of twenty years, and as it was twenty years since Mr. Sidney Spokes did a considerable series of immediate operations—he could not remember whether they were torsions—it might be that Mr. Sidney Spokes had been able to follow up some of those cases.

Mr. SIDNEY SPOKES said he was rather in a difficulty, because all his work in connection with the immediate movement of teeth was in the advancement of upper incisors over lower incisors, and his experience of torsion was not large enough to be put into the scale at all alongside that of Mr. Bocquet Bull's communication. He felt, however, that he would be inclined to fight shy of torsion. He was not at all satisfied with the few cases he had done. Unfortunately he had not a record of them, but, speaking of the past, the impression left on his mind was that immediate torsion was not a thing to be indulged in—and with regard to the future he had not much interest, except as to what other people did. His few cases of torsion were done in teeth which were older than those described by Mr. Bocquet Bull—in other words, there was an apex already formed. When one twisted round a tooth with a completed apex one really must expect to get trouble at the end of that apex; but with regard to the ordinary advancement of an ingrowing incisor over a lower incisor, he considered that that was one of the safest and simplest and most ordinary operations that one could undertake. As far as he could remember now, without having kept records of all of them, he did about a hundred of them—mostly in a large institution where he could get plenty of material; and in those hundred cases he did not think that any tooth died after the operation. He had been able to see a great many of those children two or three or sometimes four years

afterwards, and to note the condition: his strong impression was that after that interval no single tooth had succumbed. The teeth were all in very good condition, and the only trouble he had had on one occasion was a very slight chipping of the cutting edge of the tooth. That, he considered, was a perfectly justifiable operation; they were good, well-trained children leading a very healthy life. He had never regretted any of those cases, but with regard to torsion, if he were still in practice he would not do it. The results brought before the Society were valuable; but still, if he were in practice he would not treat a misplaced twisted tooth by that operation of torsion. He would not hesitate for a moment to advance a permanent tooth with Grever's forceps, and he had sometimes done both the central incisors at the same sitting—had advanced both of them side by side over the lower incisors, and he had a certain number of models which he would like to present to the Curator of the Society's Museum if he thought they were valuable enough to go on record. He did not think it was reasonable to put those two operations side by side except for the purposes of comparison. The one was a very simple one, and the other was at least a doubtful one, and therefore they should not be put in the same category; they ought to be considered as quite separate and distinct from each other. One was the simplest dental operation anybody could be called upon to do, and the treatment results were very favourable; but the other, to which more immediate consideration had been given at that meeting, was regarded by him in the same way as his friend Mr. Steadman regarded it as far as the risks were concerned. He had never had any trouble about forcing the forceps underneath the gums in order to remove the tooth. In the immediate advancement operation there was no access to the external atmosphere whatever; one really got what was called a "greenstick" fracture; one felt the external plate give as the tooth inclined forwards. The gum had never been injured in any way and everything had settled down comfortably afterwards; and there was no reason why one should get any sepsis at all.

Mr. C. H. HOUSDEN asked Mr. Bocquet Bull a question with regard to the first case shown on the screen, as to what anchorage he had got. There did not seem to be very many teeth to anchor on with his splint, and he was not quite sure where he would put his anchorage in the models shown. He also wished to ask Mr. Bocquet Bull what he considered to be the best age at which to perform the operation, and also up to what age he considered it was a safe operation. He had had a case of a lady a few weeks previously in his own private practice who had two very discoloured central incisors, and he had immediately asked her what had happened to them—had she had any treatment? They were perfectly sound on the crown, and she had had no treatment at all except when she was about eight years old, when she went to a French dental surgeon, and he had said they must be twisted. He twisted them, and he twisted one so much that it dropped on to the floor, and he put it back again. The left incisor was not so bad, and he twisted that and it remained in and did not come out. The upper right incisor was the one he started on first, and he was probably better at it when he tackled the second one! However, he (the speaker) had X-rayed the two central incisors after having opened up through both the crowns. The right central incisor had a very large canal, and the X-ray photograph showed the apex was not closed. On opening it up there was a tremendous amount of discharge, because the tooth was septic. The lady was about thirty-six years old. The tooth discharged very freely, and there was a sinus on to the gum margin. He opened up the upper left one, and found difficulty in getting to the pulp chamber. He drilled into the tooth until the patient felt it, and apparently that one had still a live pulp in it of very small calibre. He was not going to drill any further into the canal, because he was quite certain it was alive. That was the tooth which did not come out. The tooth which had dropped on to the floor was the one which became septic.

Mr. J. H. BADCOCK, in thanking Mr. Bull for his paper, pointed out that although the operation described had received a good deal of condemnation at that meeting, yet under a certain age Mr. Bull had had 100 per cent. success. Above that age he had had 100 per cent. failure, according to his figures.

Mr. HAROLD CHAPMAN said he had understood Mr. Bocquet Bull to say that the splint should not go up in between the teeth at all. It struck him that it might be simpler—and Mr. Pitts also had hinted at it—that if, instead of the cap splint, bands were made to go round the teeth, and then the bands soldered together in the relationship that the teeth are to ultimately occupy, such a splint would take up very little room and not interfere with the bite, and also be more readily capable of adjustment than a cast splint might be. He thought Mr. Bocquet Bull had brought forward a phase of the subject which many members had never practised, and which they might now be encouraged to take up.

Mr. BOCQUET BULL (in reply) first dealt with the President's point as to how the extrusion of the tooth by the forceps was avoided in most of the cases described. In one case he had mentioned that the tooth became quite loose in its socket, but he thought that was due to the fact that he had pulled it down rather much to attain its new position. There was one other case where the tooth was very loose indeed; that also was the result of the same action. With regard to Mr. Steadman's and also Mr. Dowsett's remarks, Mr. Badcock had answered them for him. He had taken particular care to point out in his conclusions (1) "that an incisor tooth with a well-open apex may safely be rotated by the immediate method"—a conclusion which he had arrived at from the fact that those cases which had well-open apices were at present in quite a satisfactory condition, and (2) those that had more or less closed apices, and also (which corresponded with their age) had died. That was the very thing he wished to point out, and which he had stated later on: "A tooth the root of which is fully or nearly fully developed should be rotated by the slow method."

Mr. Steadman had referred to a tooth which was slightly painful, and which in his experience he believed would remain painful. In the particular case the pain did not persist, because a little while afterwards, after treatment with a counter-irritant, it was perfectly comfortable, and had remained so for the following three months up to date.

In reply to Mr. Dowsett, he had already explained the difficulties of keeping records at a hospital; but, if he were alive in 1941, and the records were still accessible, he would bring them along.

In answer to Mr. Housden as to the retention for the first case, the case referred to was the rotation of an upper left central tooth. The anchorage was on the upper right central and lateral, and was shown on one of the models.

With regard to the question as to the best age at which to rotate the teeth, and beyond what age one should not go, he thought that so far as age referred to the closing of the apical foramen, it did not enter into the problem at all. It was a question of whether the root of the tooth was developed or not, and knowledge as to that could be quite well obtained by having X-ray photographs taken beforehand.

Mr. Chapman has mentioned the making of bands and their use as splints. He thought that was a very good suggestion, but the reason the splints were made in the manner shown was that one wanted the splint ready beforehand. He then asked Mr. Chapman whether he would go as far as to remove the tooth from the model, and fix it in the desired position, and then make the bands to that model?

Mr. CHAPMAN: No; make the bands in the mouth in the ordinary way, and then take an impression, and then treat the model exactly as you did to solder it together.

Mr. BOCQUET BULL replied that there was not the slightest reason why that should not be done.

THE ANNUAL GENERAL MEETING of the Society was held at 11, Chandos Street, Cavendish Square, W., on Monday, December 5th, Mr. J. Lewin Payne, retiring President, occupying the Chair.

The minutes of the previous meeting were read and confirmed.

The following new members, who were present for the first time, signed the Obligation Book and were formally admitted into the Society by the President: Messrs. Allan T. Marston, G. Pritchard, J. Jameson, Spencer Payne, J. A. P. Wright and Stanley Gardiner.

The PRESIDENT announced that the following candidates had been approved by the Council for election:—

T. A. TORRANCE, L.D.S., R.C.S.Edin., 29, Queen Anne Street, W.
A. L. PACKHAM, L.D.S., M.R.C.S.Eng., L.R.C.P.Lond., 2, Park Crescent, Portland Place, W.1.

R. A. FOX, L.D.S.Eng., D.D.S.Penn., 13, Wetherby Gardens, S.W.3.

SYDNEY B. NEWTON, L.D.S.Eng., Brooklands, Uxbridge Road, W.3.

ALLAN T. MARSTON, L.D.S., R.C.S.Edin., 74, South Side, S.W.4.

H. O. SALT, L.D.S.Eng., 24, St. Thomas's Street, S.E.1.

GEO. PARKER, L.D.S.Eng., 125, Elms Road, S.W.4.

JAS. S. BUTCHART, L.D.S., R.C.S.Edin., 2, Trinity Place, Windsor.

LESLIE D. WRIGHT, L.R.C.P., M.R.C.S., L.D.S.Eng., 1, Wellfield Avenue, Muswell Hill, N.10.

A ballot was taken, and later in the meeting the President announced that all the candidates had been duly elected.

The PRESIDENT announced that the following visitors were present: Messrs. Charles H. Liven, G. Harborough, R. Lindsay, Frank Coldham, E. P. Deverill, and Skipper and Sir Arthur Keith. He invited those gentlemen to consider themselves members for the evening and take part in the discussion.

ELECTION OF COUNCIL.

The PRESIDENT announced that the Officers and Councillors nominated by the Council had been elected, as, although nomination papers had been circulated, no private nominations had been received. The following, whose names appeared on the paper which had been circulated, were therefore elected:—

President	..	..	..	Mr. SIDNEY SPOKES.
Immediate Past President	..			Mr. J. LEWIN PAYNE.
Vice-Presidents	..	..		Mr. W. W. JAMES, Mr. SHELDON FRIEL, Mr. G. F. CALE-MATTHEWS.
Secretary	..	..	..	Mr. HAROLD CHAPMAN.
Treasurer	..	..	..	Mr. H. C. HIGHTON.
Curator..	..	..	..	Mr. B. MAXWELL STEPHENS.
Librarian	..	..	..	Mr. BERTRAM B. SAMUEL.
Editor	..	..	..	Mr. CARL SCHELLING.
Councillors	..	..	..	Mr. A. H. CLOGG, Mr. A. T. PITTS, Mr. J. H. BADCOCK.

ELECTION OF TWO AUDITORS.

The PRESIDENT said two auditors had to be appointed for the coming year, and he would be glad to receive nominations.

Messrs. G. PATON POLLITT and S. F. ST. J. STEADMAN were elected Auditors.

REPORTS OF THE HON. TREASURER, CURATOR, LIBRARIAN AND HON. SECRETARY.

The HON. TREASURER (Mr. H. C. Highton) said that during the period from December 1st, 1920 to November 30th, 1921, the total income of the Society amounted to £127 13s. 11d., which included £8 8s. 1d. interest on Government bonds. The expenditure amounted to £121 12s. 5d. The available bank balance was £42 8s. 3d., in addition to which sum the Society had £50 invested in 5½ per cent. Exchequer Bonds and £100 in 7 per cent. (*sic*) Treasury Bonds.

The Statement of Accounts for the period in question was as follows:

THE BRITISH SOCIETY FOR THE STUDY OF ORTHODONTICS.

STATEMENT OF ACCOUNTS from December 1st, 1920, to November 30th, 1921.

1919-1920.		RECEIPTS.		1920-1921.	
£	s. d.			£	s. d.
		To balances brought from last account:—			
156	5 6	Cash at Bank	.. ..	187	2 8
5	9 4	Interest on Exchequer Bonds	.. ..	8	1 1
0	7 3	Cash in Treasurer's hand	.. ..	0	7 3
102	16 10	Subscriptions received during year	.. ..	119	12 10

On the motion of Mr. J. H. BADCOCK, seconded by Mr. RILOT, the Report of the Hon. Treasurer was adopted.

The CURATOR (Mr. B. Maxwell Stephens) reported that during the year specimens had been presented by Messrs. Campion, Chapman, Warwick James, Northcroft and Spokes. The members would recall that at the end of last June he reported that a Museum Committee had been appointed. That was at the instance of their late President, Mr. Campion. The Committee decided that more suitable accommodation than was at present possessed must be found if the Society was to continue the formation of a museum. Sufficient floor space on which a specimen case could be stood was eventually provided in one of the rooms of the building in which they met that evening. A sub-committee consisting of the President, Librarian and Curator was then appointed to report further on a suitable case. That had been done, and the Council had that evening decided that it would be to the interest of the Society to make the purchase, and had accordingly passed a resolution to that effect. A report would be presented at the next meeting with regard to the series of models investigated during the year.

On the motion of Mr. HOUGHTON, seconded by Mr. McMAHON, the report of the Curator was adopted.

The LIBRARIAN (Mr. Bertram B. Samuel) said that during the current year the library had acquired by purchase three new books, namely :—

“ Index of Dental Literature, 1911-15.”

“ Orthodontia.” By Lischer.

“ Practical Orthodontia.” By Dewey.

It had also received one as a gift by the author, namely :—

“ The Care and Regulation of Children's Teeth.” By T. Widdowson.

Arrangements were in hand for effecting exchanges of translations with other societies, both in this country and America. The library was now in possession of complete sets of the Society's transactions. During the year an increasing number of the members had made use of the books.

On the motion of Mr. HOUGHTON, seconded by Mr. CALE-MATTHEWS, the report of the Librarian was adopted.

The HON. SECRETARY (Mr. Harold Chapman) then read the following report :—

THE HON. SECRETARY'S ANNUAL REPORT.

DECEMBER 5TH, 1921.

Gentlemen,

For the information of those members who are unable to attend meetings, it is necessary to say that the Society is in a most flourishing condition ; others are able to judge for themselves of the enthusiastic spirit of our proceedings.

The usual number of meetings have been held, six at which paper have been read, including that by our honorary member, Prof. Sir Arthur Keith, to be given this evening, and one at which demonstrations were given.

The Council wishes to express its sense of the honour conferred on the Society by Sir Arthur's presence here this evening.

The membership of the Society at December 31st, 1921, is as follows :—

Ordinary members	127
Corresponding members	5
Honorary members	2
Total ..	<hr/> 134

For the year ending December 31st, 1921, the figures are as follows:—

New members.. ..	36
Resignations	2
New hon. member	1
Net increase ..	<hr/> 35

This is the largest yearly increase in the last eleven years and is due largely to the energies of our President.

The Council, by means of Committees, has been engaged on several matters of importance to the Society.

A Museum Committee asked for models of treated cases, the final models to show the result at least two years after all retainers had been abandoned. The report of the Committee will be presented at the next meeting by Messrs. Campion and Maxwell Stephens.

Your Council had great hopes of obtaining further accommodation in this building so that the beginnings of a library and museum might be firmly established, but unfortunately the Society was not given the refusal of the proposed accommodation.

However, the Committee is considering the best form of moveable cabinet for the storage of models and books, as it is hoped that house room will be given for such a cabinet, so that the nucleus of a museum and library may be properly housed.

The Council has decided that the former practice of printing and circulating the papers to be read at the meetings with the agenda shall be reverted to and requests that all communications be illustrated by means of lantern slides in preference to placing models in the epideiascope for reasons known to all. The cost of the lantern slides will be defrayed by the Society.

The Council has also decided that the transactions shall be published twice annually, the first volume to contain the reports of the meetings, January to May inclusive; and the second to contain those for October to December inclusive and the index for the year. The Council greatly regrets the delay in the publication of the transactions in arrears, which were sent out this week. Those for 1921 will be issued in one volume about May next.

An Education Committee was appointed at the March meeting of the Council "To consider the present methods of teaching orthodontics in Great Britain and Ireland, to report thereon and to make recommendations, if thought fit." This Committee has met several times and a sub-committee of the full committee has met frequently. The Committee will report next year and doubtless this report will be presented to you in due course.

There have been several requests from U.S.A. for complete files of the Society's transactions. At the request of the *International Journal of Orthodontics*, the Council has given that journal the privilege of publishing the transactions of the B.S.S.O., subject to arrangement with our own publishers here in London.

In the belief that it will suit the convenience of members better the Council has changed the meeting day from Wednesday to the first Monday in the month, except in the case of January when the meeting is fixed for the third Monday; meetings will therefore be held on the first Mondays of the months of February, March, May, October, November and December, and on January 16th, 1922.

HAROLD CHAPMAN,

Hon. Secretary.

On the motion of Mr. BULL, seconded by Mr. MESSENGER, the report of the Hon. Secretary was adopted.

THE GROWTH MECHANISM OF THE FACE.

By Professor Sir ARTHUR KEITH and Mr. G. G. CAMPION.

The PRESIDENT said that the present was the first opportunity the members had had of welcoming Sir Arthur Keith since he had honoured them by becoming an honorary member of the Society. The members were delighted to see him present that evening.

Sir ARTHUR KEITH, before reading his paper, said he felt that he and Mr. Campion owed the members an apology for breaking in, as it were, on the business of the annual general meeting with their rather complicated paper. He counted it a great honour that he had been elected an honorary member of the Society, and felt it a privilege to be allowed to appear before the members that evening and lay before them some of the work that he and Mr. Campion had done.

A CONTRIBUTION TO THE MECHANISM OF GROWTH OF THE HUMAN FACE.

By SIR ARTHUR KEITH and GEORGE G. CAMPION, L.D.S.

*(Paper read at the Meeting of the British Society for the Study of
Orthodontics, December 5th, 1921.)*

IN the spring of the present year the two authors found that they were investigating the same problem—namely, the growth of the face in childhood and youth—by different methods. While one (G. C.) was measuring the amount of growth which takes place at succeeding age periods, the other (A. K.) was seeking to determine by the study of immature and mature skulls the sites at which such growth takes place. Both authors are and were of opinion that the entire face is essentially a part of the apparatus of mastication and that irregularities of the jaws, in size, shape and position, can be explained only when a study is made of the ingenious and elaborate mechanism which underlies growth of the face as a whole. The authors have consequently pooled their results.

For measurement of the forward growth of the face—growth forward in a sagittal plane—the external auditory meatus has been taken as a base from which to estimate the forward movement of various points between forehead and chin. Sutural lines at which this advance takes place involve not only those lying in the face, but particularly those situated in the base of the skull and in the lateral wall of the skull. Growth of the face in height, as measured from the nasion to the lower margin of the chin, is confined to sites and sutures of the face, as above defined. In the opinion of one author (A. K.) the supraglabellar depression marks the upper limit of the masticatory face, but unfortunately its limits are so often imperfectly marked that it has not been included in our measurements. In the present paper the side to side or lateral increase of the face is only dealt with by one author (A. K.). In his opinion the most frequent derangements of growth, seen in modern English faces, is due to a deficiency or alteration in the lateral expansion which ought to take place in normal children. The most important suture involved is that between the maxilla and malar or jugal bone on each side of the face. Evidence will be adduced for believing that the median sagittal suture of the palate takes a very active part in adding to the palatal width. There are also reasons for believing that the bone-substance which surrounds dental buds and sacs, as well as tooth sockets, is controlled by a mechanism which differs from that regulating bone growth in the rest of the face. Further, it will be shown that the distance

between one temporo-mandibular joint and another is dependent on growth at the base of the skull. The width of the base of the skull and of the face is increased by bone being laid down in the spheno-temporal suture. The base of the skull is transformed in size and conformation between the 5th and 18th years to a much greater degree than is usually realised. Lastly, it will be demonstrated that the acromegalic face is enlarged by a process of true growth.

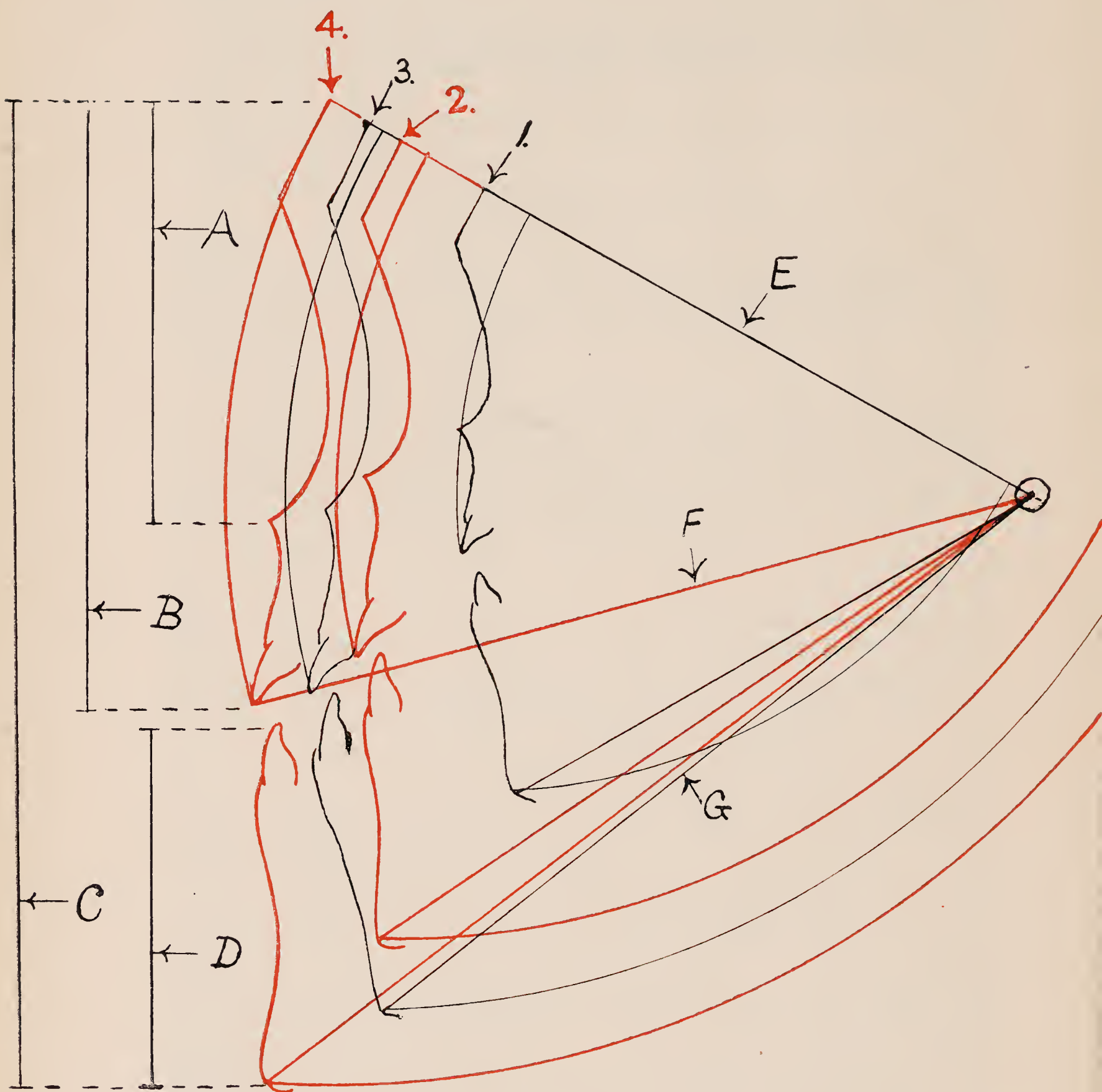


FIG. 1.—Diagram, showing vertical and forward growth of the norma or sub-normal face. Vertical measurements taken from nasion, forward measurements from trans-meatal axis. The arcs centred at the meatal axis show the progressive growth forwards along line F in relation to that along line E. The arcs centred at the nasion show the progressive vertical growth along line C in relation to that along line E.

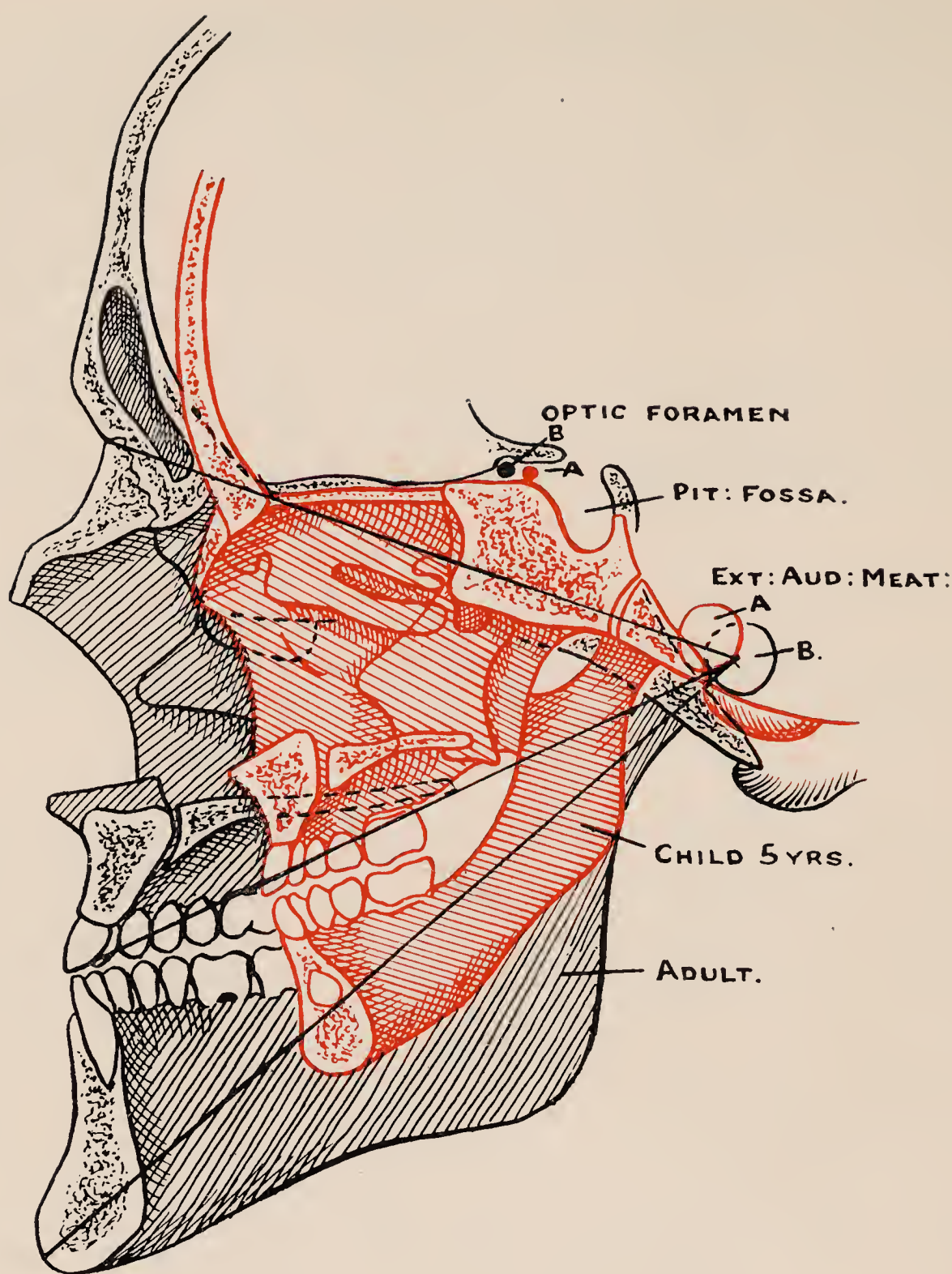
Profile 1. From child aged 3 years and 6 months.
 „ 2. Represents mean of 10 children aged 9-11 years.
 „ 3. „ „ 9 „ „ 15-16 „
 „ 4. „ „ 10 adults. (Campion).

TABLE I
 MEAN AND STANDARD DEVIATIONS (CAMPION).

<i>Vertical Growth.</i>			
	9-11	15-16	ADULT.
A. Nas. to Sub-nas. point	42.9±2.55	49.3±2.26	53.2±3.75
B. Nas. to Upp. Inc. ...	64.0±2.19	72.6±4.11	76.7±4.56
C. Nas. to Sub-mental point	100.1±2.60	111.4±5.49	122.8±7.67
D. L. Inc. to Sub-ment. point	35.8±1.17	40.8±1.83	44.7±3.34
<i>Forward Growth.</i>			
	9-11	15-16	ADULT
E. Trans-meatal axis to Nas.	89.9±4.1	95.6±3.16	100.4±3.87
F. Trans-meatal axis to Inc.	86.6±2.97	94.0±4.29	100.6±6.36
G. Trans-meatal axis to Mental eminence ...	98.6±3.67	104.3±4.9	119.9±8.65

In Fig. 1 are summarized the results obtained by measurements made on the living face—the number of individuals included being mentioned in the legend to the illustration and the means of the measurements reproduced in Table 1. The first question we seek to answer on this paper is: How does the forward growth of the face take place? The advance is measured from the trans-meatal axis or line—one passing through the centre of the ear passage on each side of the head. We shall take first the advance of the nasion, which is moved in a forward direction owing to new bone being laid down somewhere along the line E (E, Fig. 1). The points at which such bone is laid down may be seen in Fig. 2, where a sagittal mesial section of a child's head, aged 5 years, is superimposed on a corresponding section of a skull of an Englishman with a well-formed face, with dimensions rather above the average. The superimposition has been made so that pituitary fossa falls on pituitary fossa, and cribriform plate on cribriform plate, because a prolonged experience has shown one of us (A. K.) that the pituitary or sphenoid region serves best as a fixed point in comparing the development or growth of one skull with that of another.

As represented in Fig. 2, the nasion has advanced by growth from a point 73 mm. in advance of the trans-meatal axis in the 5th year (A) to one 96 mm. in advance, in the adult B; in the space of some sixteen years 23 mm. of additional bone has been laid down at various points along line E; 5.7 mm. of new bone is laid down in the forward line E from the 10th to the 16th year, 4.8 mm. being laid down after the 16th year. The length of the line E on newly-born children is about 48 mm.—but the exact amount must be determined—not in the dried skulls at our disposal, but in moist skulls, with the cartilaginous parts unshrunk. Broadly speaking, the line E is doubled in length by the growth which takes place from birth to adult age. From the standard deviations given in Table I, it will be seen that the line E is the least variable of the three forward measurements.



($\frac{2}{3}$ natural size.)

FIG. 2.—A : Sagittal mesial section of skull of child with M^1 about to erupt, and estimated to be 5 years of age. B : Corresponding section of skull of adult Englishman. The skulls are superimposed so that the pituitary fossæ and cribriform plates correspond. The sections show the amount of growth in the sagittal mesial plane from the 5th to the 25th years.

In Fig. 3 is given a diagrammatic analysis of the sites of growth along line E. Growth occurs at three sites in the basal part of the "E" or naso-meatal line, viz., at the fronto-nasal site (A) ; speno-ethmoidal junction (B) and at the speno-occipital junction (C). In the samples chosen, the nasion has been advanced 23 mm. from the 5th to the 21st years ; 7 mm. has been obtained by deposition or addition to the outer surface of the naso-glabellar region of the frontal, and by the formation of the frontal sinuses ; 10 mm. have been interpolated at the speno-ethmoidal junction ; the remainder 6 mm. at the speno-occipital junction.

Taking these sites of growth in the order shown in Fig. 3 we see that at the fronto-nasal region (A in Fig. 3) the nasion, in the samples chosen, has moved in an upward and forward direction

to the extent of 11 mm. from the 5th to the 25th years. The cribriform plate was taken as a fixed base from which to measure the upward movement of the nasion. This upward movement at first surprised us, but on further investigation we find this to be the rule in modern English skulls, but in the skulls of primitive native races and in prehistoric English skulls this upward movement is usually replaced by one in a forward, often combined with a downward direction. The important point to note is that this naso-glabellar addition has nothing to do with growth of brain; it is directly related to the development of the masticatory apparatus; the supra-orbital and glabellar region of the frontal bone are intrinsic parts of the bony scaffolding on which the maxillæ are set and from which the muscles of mastication exercise their power. The bone laid down at this site is a superficial deposit on the naso-glabellar surfaces of the frontal and nasal bones. The upward and forward growth of the nasion gives the high frontal root to the nose seen in the classical statuary of ancient Greece.

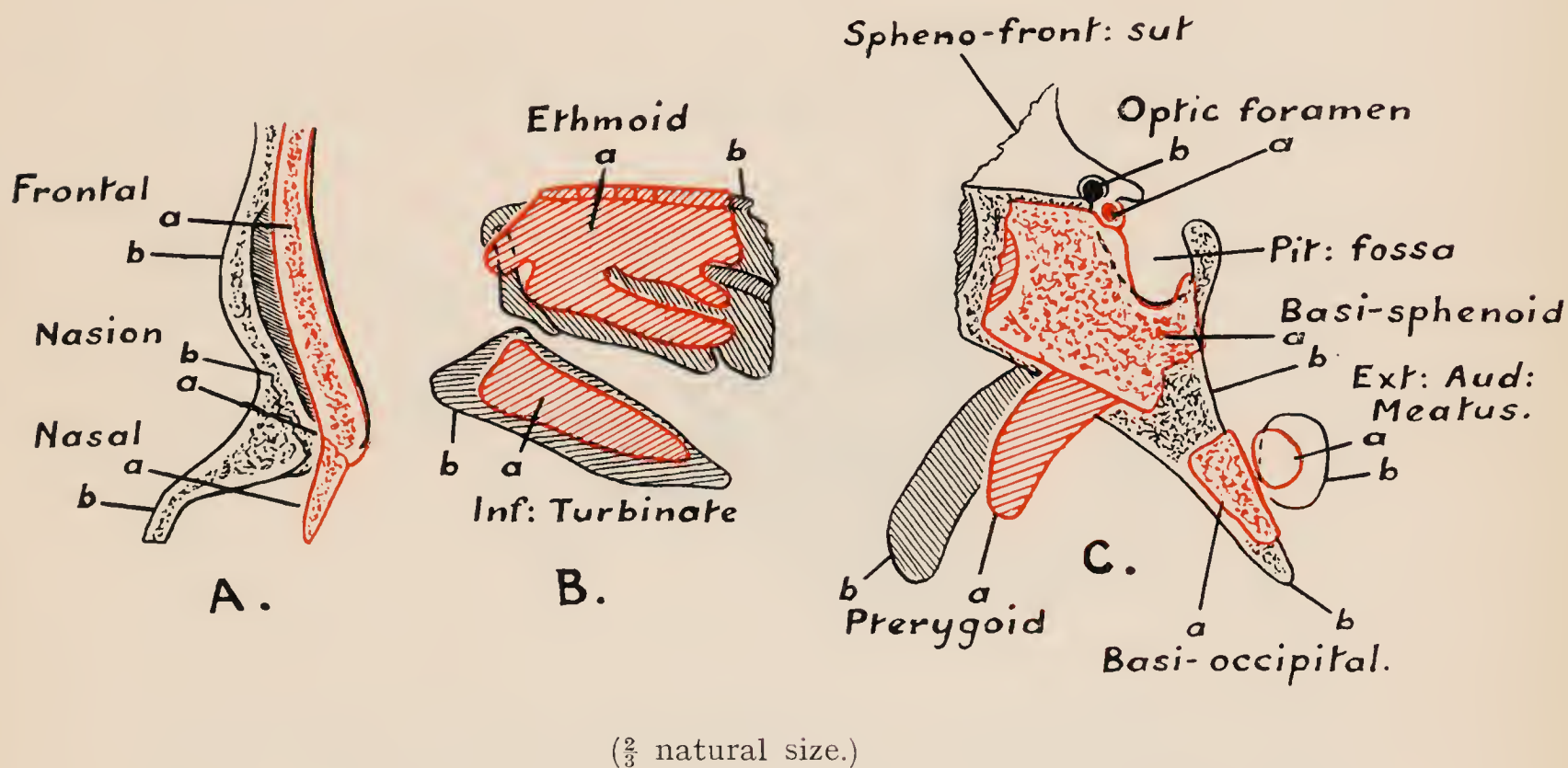


FIG. 3.—Sites of growth along line E in basal parts of skull (a) child, aged 5 (see Fig. 2): (b) adult (see Fig. 2). A: Fronto-nasal element; B: Ethmoidal element; C: Sphenoidal element.

The amount of growth at the fronto-ethmoid junction (B, Fig. 3) appears to be very restricted, but it is otherwise at the spheno-ethmoidal junction. This suture is concerned not only in the growth of the face, but also in the increase of the nasal cavities and particularly of the brain space. At this junction growth takes place by the transformation of cartilage into bone; as we shall see later, it is part of the great coronal system of cranial growth-sutures—a system involved in facial as well as cranial growth. Our chief interest in the spheno-ethmoidal suture at the present moment is because it is concerned in providing space for the erupting maxillary molars. About thirty years ago,*

* "The Relationship of the Eruption of the Permanent Molar Teeth to the Expansion of the Maxillary Sinus."—*British Journ. Dental Sc.*, 1902, vol. 45, p. 529.

one of us (A. K.) showed the importance of the pterygo-maxillary suture during the growth of the upper jaw and the eruption of the upper molars. One of the illustrations then published is reproduced here (Fig. 4). A glance at Figs. 3A and at Fig. 4 shows that the speno-ethmoidal cartilaginous junction and the pterygo-maxillary fissure are parts of the same coronal sutural system—one where additional alveolar and maxillary space is obtained during the eruption of the permanent molars. It is true that in the disorders of growth known as achondroplasia (2), and also in another disorder, acrocephaly, there is a profound arrest of growth in the speno-ethmoidal junction without any failure in the development of the molar part of the maxilla. In achondroplasia the maxillary part of the face undergoes the rotatory movement so well illustrated in the snub-face of the bull-dog, and thus obtains molar space; in acrocephaly (2) compensation is got in another way.

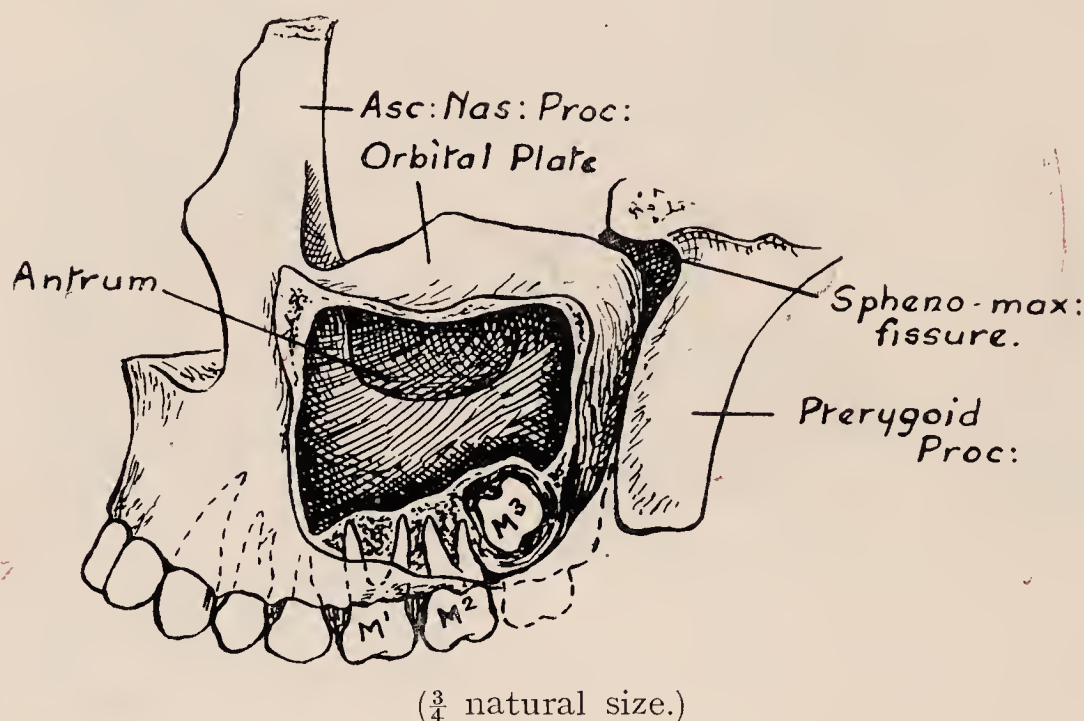


FIG. 4.—Sagittal section of the maxilla of male aged 19, with crown of third molar still unerupted. The growth of the alveolar border and the position of M3 when in place, are shown by stippled lines. * The external pterygoid process and pterygo-maxillary fissure are also shown.

The important part taken by the pterygoid process in the machinery of facial growth in a forward direction is indicated in Figs. 3C and Fig. 4. From the 5th to the 35th years, in the samples chosen in Fig. 3C, the lower part of the pterygoid process has extended in a forward direction to a distance of 9 mm. and in a downward direction to about an equal extent. During the years of growth the pterygo-maxillary fissure is being moved forwards, which indicates that the maxilla as a whole must also be moved. Throughout this period, too, new alveolar bone is being laid down in the molar alveolar region, immediately in front of that part of the pterygo-maxillary fissure which is occupied by the tuberosity of the palate bone. There is a class of case, a fine example of which is at present under the observation of Sir Francis Farmer, where there is no forward movement of the maxillæ, the alveolar

* See article and illustrations by Keith in *Journ of Anat*, 1913, vol. 47, p. 189.

bone, which should have formed the sockets for the upper 2nd and 3rd molars being heaped up as a mass on each side of the palate in front of the lower or palatal ends of the pterygoid processes.

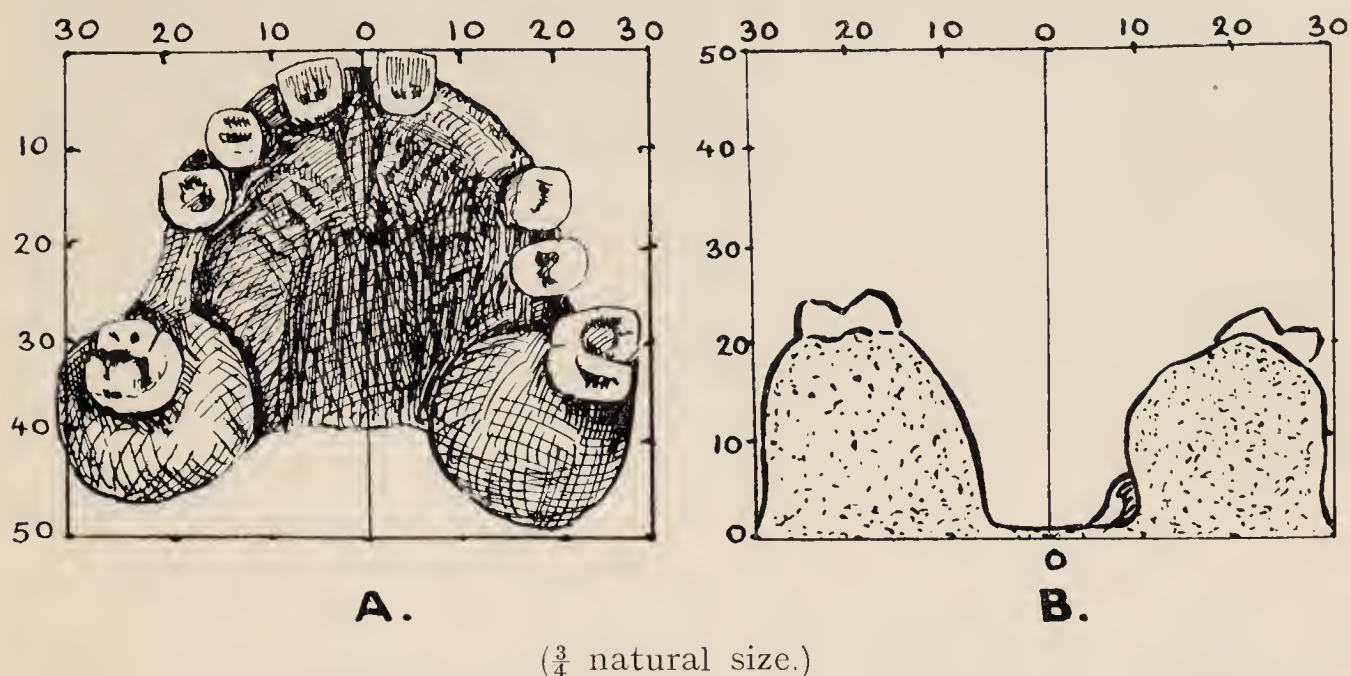


FIG. 4A.—Drawing from cast of palate of young woman. B represents a coronal section at sites of alveolar enlargement.

We now come to the third of the deep sites involved in the growth along the line E (Figs. 1 and 2). The growth in the spheno-occipital cartilaginous junction, from the 5th to the 25th year is about 9 or 10 mm. in extent (see Fig. 3C), but not more than 5 or 6 mm. are added to the extent of the naso-meatal radius. For this reason: the growth at this suture is concerned chiefly in giving pharyngeal space—space for breathing and swallowing. It will be noted (Fig. 3C) that this growth junction lies in front of the external auditory meatus; growth at the junction leads to a displacement of the temporal bones and ear passages in a backward and downward direction; there may also be a forward movement of the sphenoid, but in a system of relativity, such as the growing skull is, it is most convenient to regard the body of the sphenoid as a fixed basis which, for practical purposes, it is. The increase at the spheno-occipital junction thus increases the E line by carrying the meatal base backwards and downwards to an average extent of some 5 or 6 mm. Space is thus obtained for growth of mandible, throat and mouth. In achondroplasia, growth at this suture ceases at birth or soon after, a series of compensatory growth mechanisms being brought into play to give the needed pharyngeal space.

So far we have merely examined and illustrated the *deep* sites of growth concerned in the increase of line E; the more superficial sites concerned we can examine more conveniently at a later stage. We now turn to the sites of growth concerned in line F (Fig. 1), where the increase is estimated by measuring from the trans-meatal axis to the incisive margins of the upper central incisors. The structures and sutures involved in this line are represented in Fig. 2, while in Fig. 5 an analysis is given of the amount of increase at the various sites of growth along the line. As may be seen from Table 1, the incisive margins of the upper central incisors were 86.6 mm. in front of the trans-meatal axis in the 10th year; by the 16th year they had reached 94.0 mm., an increase of 7.4 mm. in six years, while the point reached in the final period of advance

was 100.6 mm., showing an average increase of 6.6 mm. during the later years of adolescence—the years in which the 3rd molars were, or should have been, erupting. One very interesting point is brought out by this table of measurements. At the 10th year the F line showed a much greater degree of stability than the E line as measured by the standard deviation; but by the 16th year matters had become reversed; in the individuals measured the F line fluctuated in its dimension much more than the E line; some growth factor had come into operation in the “F” line, which varied greatly in its incidence, being great in one individual and small in another. This difference in variability becomes even greater in the later stages of growth; the standard deviation for F is nearly twice that for E in adult skulls. Why this variation should mark growth along the line E will become apparent as we proceed.

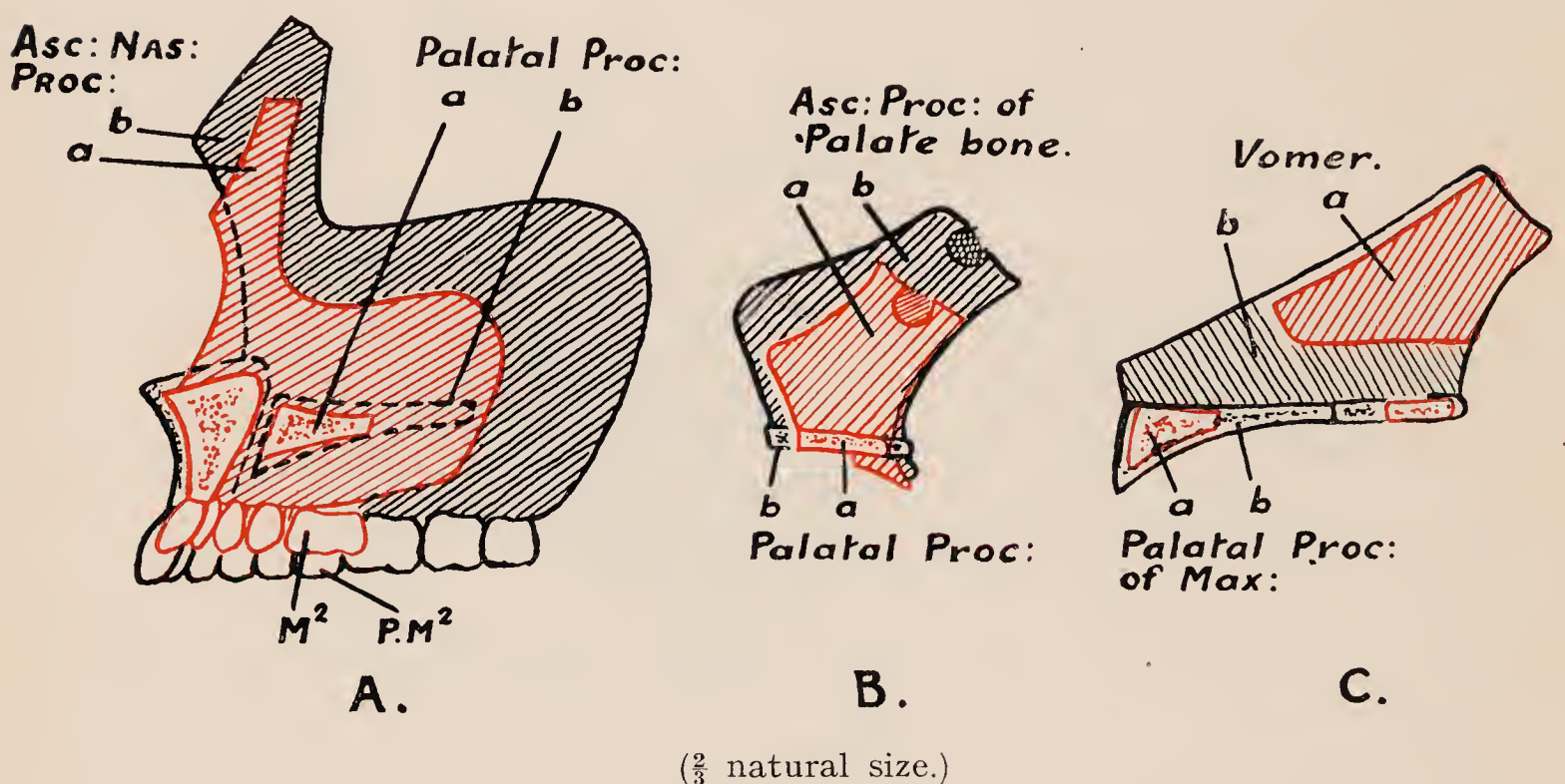


FIG. 5.—Analysis of growth-sites along line F: A, Maxilla (a), mesial aspect of a child aged 5, superimposed on maxilla (b) of adult (same skulls as are represented in Figs. 2 and 3); B, Palate bone (a) of same child superimposed on adult bone (b); C, Vomer and palate (a) of child superimposed on corresponding parts of adult (b).

In Fig. 2 the central incisor crowns lie 73 mm. from the trans-meatal axis in the skull of the 5-year-old child; 106 in the adult. In the samples chosen the incisor crowns have been advanced 33 mm. In Fig. 5 the points at which this increase is obtained are shown. By far the greater amount—about 16 mm.—as is seen in Fig. 5, is obtained by addition at the posterior area of the maxilla—the area lying in front of the pterygo-maxillary fissure, where the molar part of the alveolar margin is produced. The eruption of the permanent incisors extends the F line about 5 mm. in a forward and downward direction (Fig. 5A). The other sites and structures concerned in the increase of this line have been mentioned already—the forward extension of the pterygoid prop, and the growth at the spheno-occipital suture producing a backward

movement in the meatus. The great variability in the length of the line F depends very largely on the amount of bone laid down in the molar part of the maxilla and on the forward extension of the pterygoid prop.

The reader will observe in Fig. 5A that in superimposing the 5-year-old maxilla on the adult specimen we have taken the naso-palatine canal as the most fixed point, placing premaxilla on premaxilla, and the palatal plate of the maxilla on the corresponding element. At this point the question may be raised: is any point of the growing maxilla more fixed than another? Everyone will agree that the molar region of the adult jaw—the alveolar areas with the superimposed part of the maxillary sinus—are parts which come into existence as the molar crowns are developed and come into use. We do not maintain that the naso-palatine canal is absolutely fixed but the palatal area in its neighbourhood is the part which is least altered during growth.

The growth of the palate bone, which also helps in the forward growth of the incisor area, is shown in Fig. 5B, the new bone being apparently added at its posterior as well as at its anterior margin. In Fig. 5C the growth of the vomer is shown; bone has to be laid down in the vomer, chiefly along its palatal or lower border, to keep time with the maxillary growth in front of the pterygo-maxillary fissure. The buckling of the septum of the nose is due, in part at least, to a lack of harmony in growth at the maxillary and septal sites. One point, shown in Fig. 5C, we would draw particular attention to: it is the importance of the transverse palatal suture—the suture in the bony palate between the maxillary and palatal elements. Bone is laid down in this suture at even a greater rate than at the posterior aspect of the maxilla. Growth at this suture has to keep time with the maxillary increase. In Fig. 5C, 18 mm. of new bone is shown as having been interpolated at the transverse palatal suture between the 5th and 25th years, three-fourths of the addition being made on the maxillary side of the suture. Thus it will be seen that the forward growth along line F involves a series of growth sites and demands the existence of a hormone or growth regulating system to co-ordinate the rate of increase at the diverse points of increase.

Here, too, we must call attention to a phenomenon which seems to have escaped observation hitherto—the process of absorption or remodelling which affects the nasal aperture and ascending nasal processes during the period of growth. In Fig 5A, an anterior margin of the nasal aperture is seen to rise from the premaxillary element close behind the nasal spine at the 5th year, whereas in the adult it springs from the premaxilla just in front of the line of the naso-palatine canal. We have seen that the naso-palatine may be regarded as a fixed region; it is not the premaxillary element that has moved forward but the ascending nasal process which has been cut back. The process is identical to that seen in the ascending ramus of the mandible; while new bone is being laid down on the posterior border of the body of the maxilla, old bone is being absorbed from the margins of the pyriform or nasal aperture. As regards the ascending process of the maxilla—the process interpolated in the root of the nose, between the lachrymal behind and the nasal bone in front, new bone is laid down at all its margins (see Fig 5A).

We here touch on the other series of the lines of measurements given in Table I, those along which growth is estimated in a vertical direction. Two of these we will refer to here in the briefest manner: the lines A, from nasion to sub-nasal point (Fig. 1), and B, from nasion to incisor crown (Fig. 1). At the 10th year the mean length of line A measures 42.9 mm.; by the 16th year, 6.2 mm. has been added; at full growth, the line reaches 53.2 mm., only 3.9 mm. being added in the later years of growth. The total increase from the 10th to the 25th years, is 10.3 mm.; the specimens represented in Fig. 2 indicate an increase of 14 mm. on line A from the 5th to the 25th years. A glance at Fig. 5A shows that this increase, so far as concerns the outer aspect of the face is almost entirely confined to the growth of the ascending nasal process; but there is, in the depth of the face, a pronounced increase in vertical height of the body of the maxilla—the part enclosing the maxillary sinus. Also there is an increase in the vertical height of the septal and lateral walls of the nasal cavities, which is not easily estimated in the living (Fig. 5). New bone is being constantly formed in the maxillary floor of the orbit—in the roof of the maxillary sinus, leading to a thrusting downwards of the body of the maxilla and palate. As shown in Figs. 5, B and C, there is a corresponding growth on the vertical plate of the palate bone in the region of the sphenopalatine canal—and another along the lower border of vomer and vertical plate of ethmoid, leading to a downward and forward thrust of the palate. The vertical increase in the body of the maxilla and corresponding nasal parts is about 8 mm. from the 5th to the 25th years.

In line B another element becomes included—the growth of the alveolar part of the maxilla. It is not necessary to go into all the reasons which have led us to regard the alveolar part of the maxillæ—the part which lies below the level of the hard palate and forms the bony sockets for the teeth—as a distinct growth element, a plastic element regulated by its own independent growth system. The height or length of the face, particularly of the upper face, depends largely on the manner in which alveolar growth takes place. In Table I the length of line B, from nasion to central incisor crown, measures 64.0 mm. at the 10th year, 72.6 mm. at the beginning of the 16th, 76.7 mm. in adults; the fluctuations in height become greater the older the group of children examined. The difference between the lengths of the A and B lines represents the depth or height of the premaxillary part of the jaw; at the 10th year the premaxillary element measures 21.1 mm.; at the 16th year 23.3 mm.; in adult life 23.5 mm.; there is thus, after the eruption of the permanent incisors, only a slight increase in the height of the alveolar region of the maxilla. On the other hand there is a marked increase with the eruption of the permanent incisors (see Fig. 5A).

This is the most convenient point at which to introduce a common and remarkable conformation of the subnasal region of the premaxillary, one which is seen in quite 10 per cent. of modern English skulls to the degree represented in Fig. 6. One palate, A, is of the primitive type, with wide flat palatal plate, the alveolar borders being well apart and regularly developed. The other is a narrow contracted arched palate with high or deep alveolar margins. The two are superimposed so that the naso-palatine and palatal regions correspond. In the latter skull the nasal spine

is very projecting and depressed, while the margins of the nasal or pyriform aperture have grown so as to separate the floor of the nose from the face by a sharp, deep ledge of bone. The alveolar margins in this skull are deeper than usual, particularly in the premaxillary region—the crown of the central incisor being 12 mm. lower than in the normal palate. This modern derangement of growth is almost confined to the alveolar element of the maxilla, leading to an increase of the “B” line by 10 or 12 mm. ~~It will~~

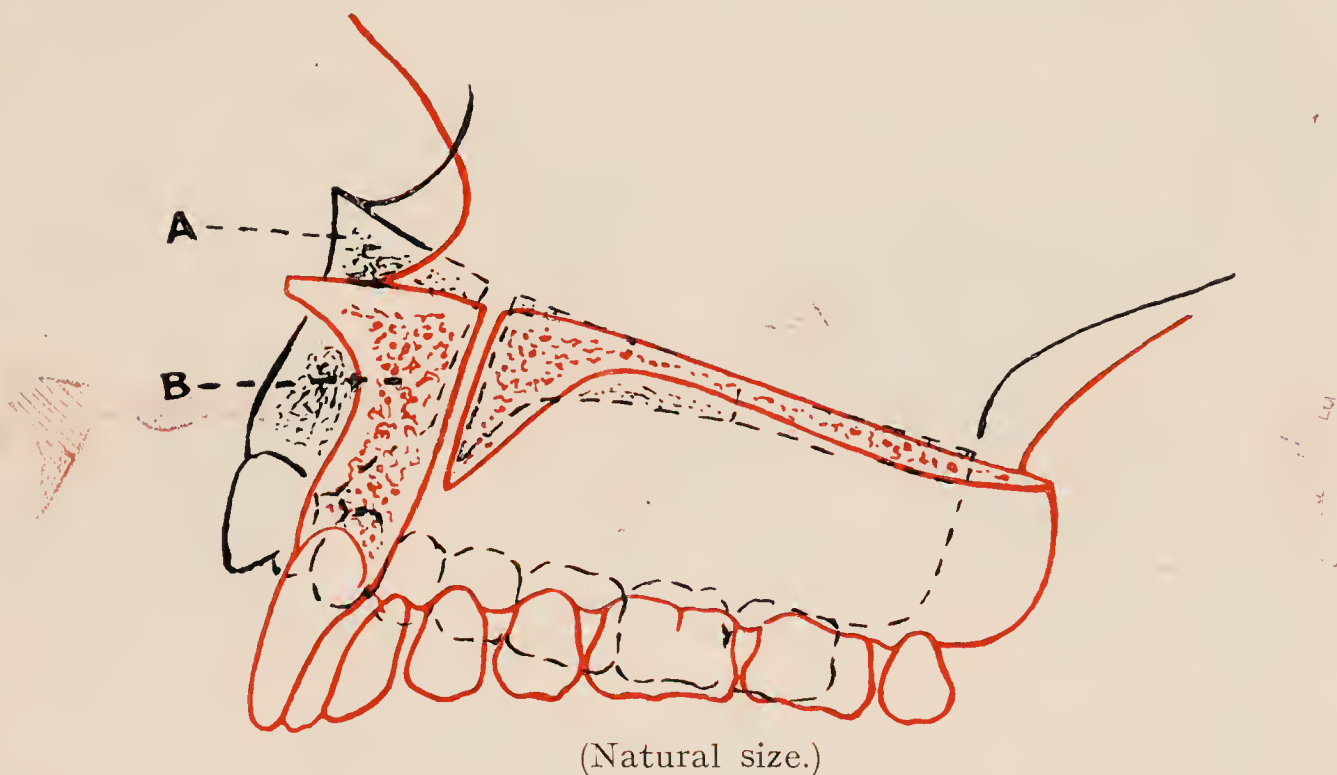
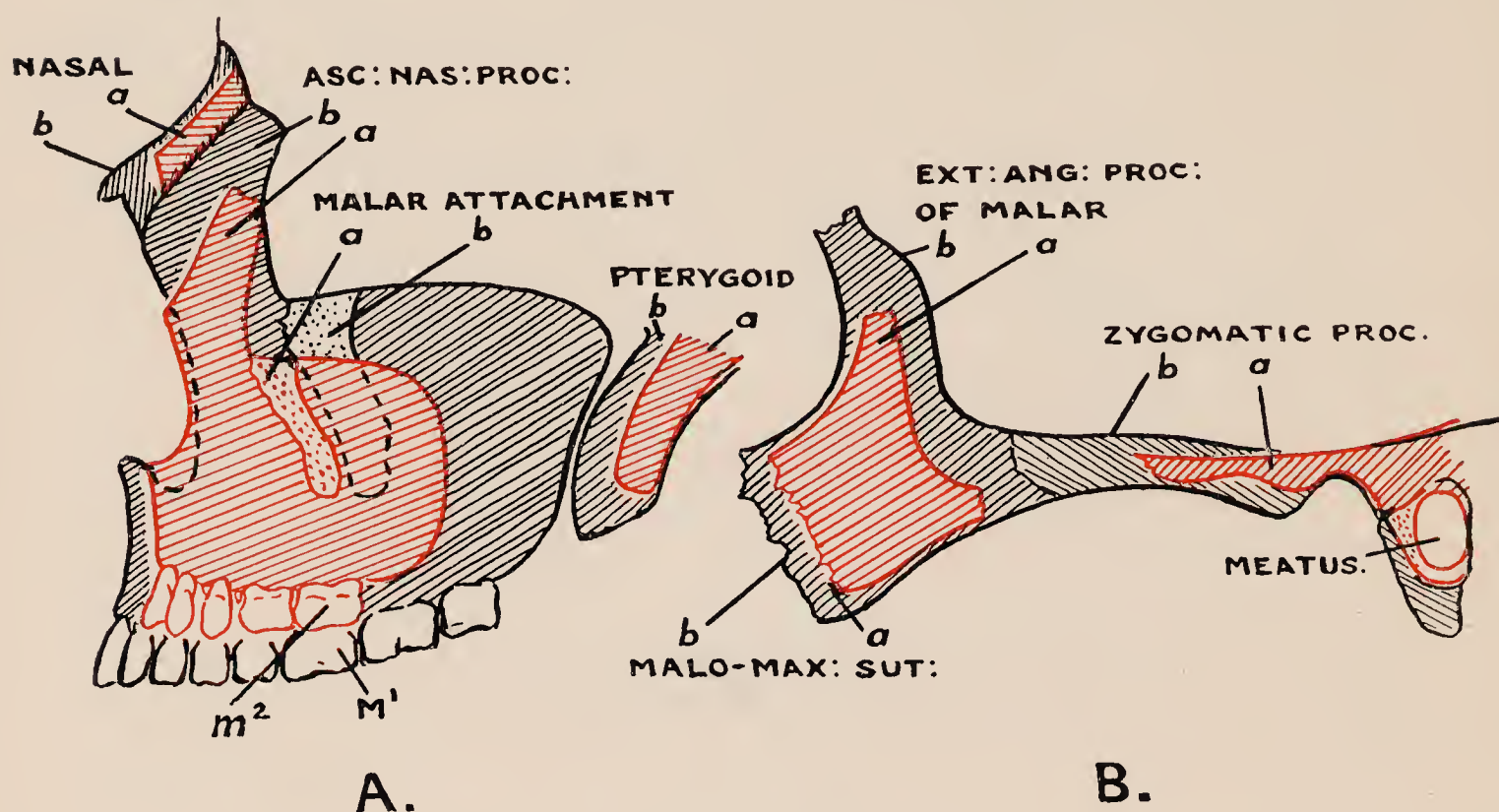


FIG. 6.—Sagittal mesial section of a palate, showing a marked degree of narrowing or contraction (B), superimposed on a wide well-developed English palate (A). Both from male skulls.

~~be observed that the first molar tooth of the contracted palate lies in the forward plane corresponding to the second molar of the normal palate; the forward movement of the teeth has been arrested.~~ The length of the dental arch in profile, as seen in Fig. 6, is 6 mm. longer than in the normal palate. Thus increase in the direction of the line B may not be the result of a normal but of an abnormal growth. We shall see that with this abnormal increase in height of the upper face, there is a marked reduction in width measurements.

So far we have been dealing with sites of growth lying deep within the skull, situated on or near its mesial vertical sagittal plane. We now turn to the superficial sites and sutures concerned in the forward extension of lines E and F (Fig. 1). In Fig. 7 we have treated the trans-meatal axis as if it were a fixed and not a movable base; its movement does not alter the estimate of growth at the various sites. The first growth suture we direct attention to is that situated in the zygomatic arch, between the temporal and malar elements. This suture it will be observed lies directly over the pterygo-maxillary fissure in front of which new maxillary bone is added. It will thus be seen that the temporo-malar suture is part of the great coronal system—including the coronal suture itself, the fronto-sphenoid (Fig. 3C) the spheno-ethmoidal (Fig. 3C),

the pterygo-maxillary (Fig. 7A) and the transverse suture of the palate (Fig. 5C). The addition at the temporo-malar suture from the 5th to the 25th years is about 16 mm., being equal, in an antero-posterior direction to the amount laid down on the posterior region of the maxilla. In the growth of the face the rate of increase at all of these sites must be regulated by a co-ordinating mechanism.



($\frac{2}{3}$ natural size.)

FIG. 7.—A: Lateral aspect of maxilla and nasal bone of a child of 5 (a) superimposed on the corresponding parts of adult male skull (b). The area to which the malar applied is indicated by stippling. The pterygoid processes are also superimposed. B: Temporal and malar elements of the zygomatic arches of the same individuals superimposed to show the extent of growth at the temporo-malar and malo-maxillary sutures.

At the malo-maxillary suture, although a great addition is made leading to increase of width of face, only a few millimetres are added so as to give a forward growth in the direction of lines E and F.

In Fig. 7A the addition made in the region of the pterygo-maxillary fissure between the 5th and 25th years is again shown, this time from the lateral aspect. The superimposition adopted in Fig. 7A brings out the alveolar growth at the eruption of the permanent incisors. The cutting back of the margin of the nasal aperture and the growth of the ascending nasal process, as seen on the lateral aspect of the face, are also brought out. We would direct special attention to the remodelling and backward movement of the malar process of the maxilla. In the 5th year it occupies a forward position in the flat face of the child; in adult years it has been shifted back by a process of remodelling—absorption on its facial surface with addition to its posterior or zygomatic surface. So far we have not met with any mention in published literature relating to this growth-transformation in the cheek region of the child's face.

As regards additions made to the vertical height of the face little need be said so far as concerns the parts shown in Fig. 7. The increase in height and breadth of the ascending nasal process of the maxilla has already been described ; here we call attention to the growth of the corresponding process in the outer or lateral wall of the orbit—the frontal process of the malar. This process, between the 5th and 25th years has 11 mm. added to its vertical height (Fig. 7B). The addition made at the lower or masseteric border of this bone is relatively slight—3 or 4 mm. only, except in cases of contracted palate when the masseteric border occupies an abnormally low position. The increase in height at the alveolar border has been mentioned already.

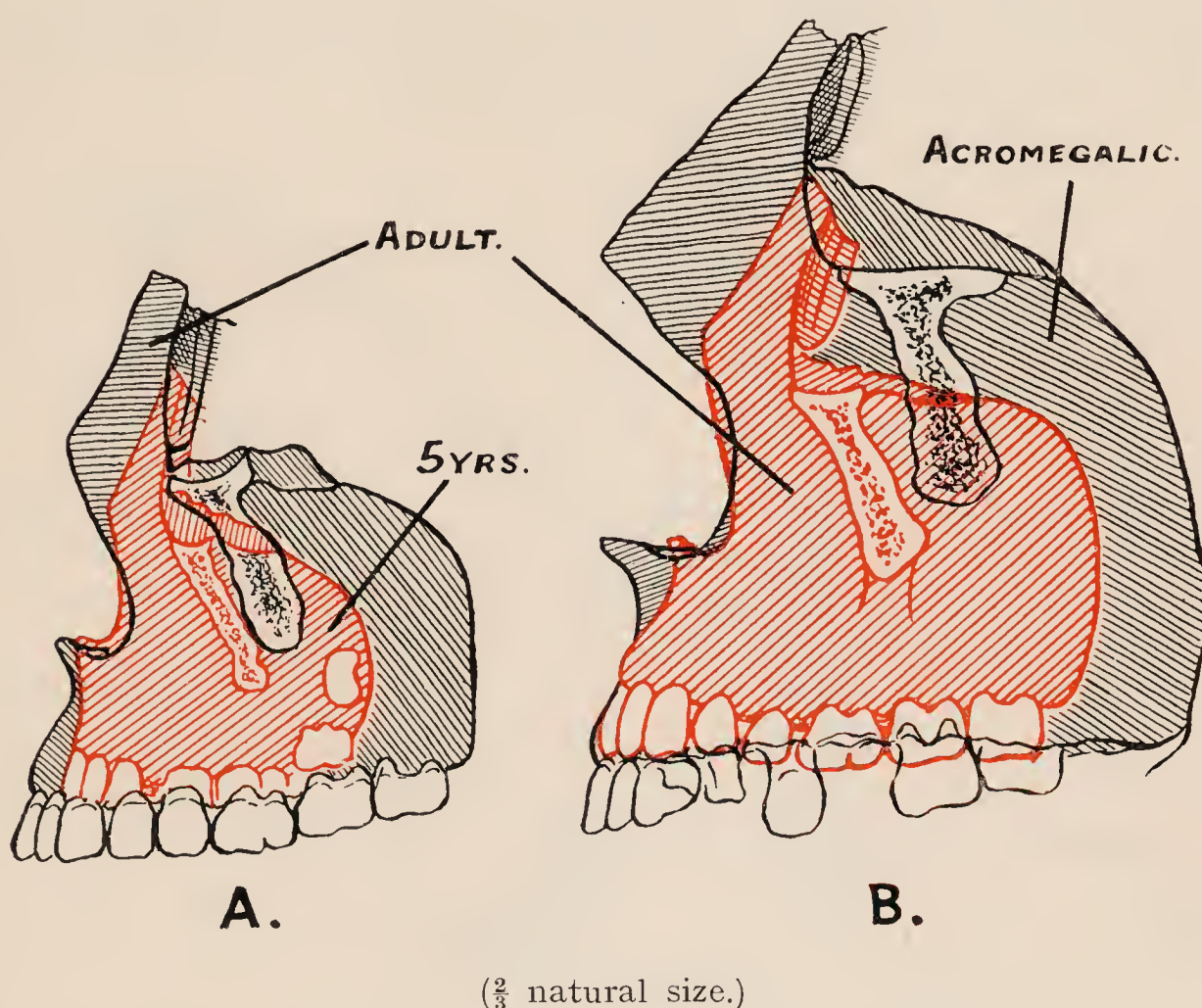


FIG. 8.—A : Left lateral aspect on maxilla of child of 5 years superimposed on maxilla of adult Englishman. The specimens represented are not those shown in Fig. 7 although they illustrate corresponding age changes. B : The adult bone shown in Fig. 8A, superimposed on the maxilla of a man who was the subject of a chronic form of acromegaly. These specimens show the same kind and degree of difference as are depicted in Fig 8A.

In Fig. 8 a demonstration is given to show that the changes which occur in the maxillæ of acromegalics are of the same nature as those which occur in the faces of growing children. At the same time we cannot fail to note the influence of the pituitary body on facial growth ; with a disordered enlargement of the pituitary we see all the growth changes of youth reawakened in the adult. In Fig. 8A the maxilla of a child of 5 years is superimposed on the maxilla of an English adult male with well-developed face. The specimens are not those shown in Fig. 7A, but the changes due to growth are of the same nature although differing in detail. In Fig. 8B, the normal adult maxilla shown on Fig. 8A is superimposed on the maxilla of a man who had been the subject of

acromegaly for over 15 years. The growth changes seen in Figs. 8A and B are clearly of the same nature and almost the same degree.

THE SUPRA-ORBITAL REGION OF THE FRONTAL AND ITS RELATIONSHIP TO THE FUNCTION OF MASTICATION.

In everyday speech we count the forehead an essential part of the face but anthropologists have found it convenient to exclude it from the "anatomical" area to which they give this name. That the supra-orbital region of the frontal is, like the cheeks and jaws, an essential part of the apparatus of mastication there can be no manner of doubt. These stout bony struts, the ascending nasal processes, go up between the orbits to rest the maxillæ on the mesial part and supra-ciliary regions, of the supra-orbital bony bar, the glabellar; on the outer or lateral wall of the orbit, the frontal processes of the malars prop the maxillæ on the external angular extremities of the supra-orbital bar.

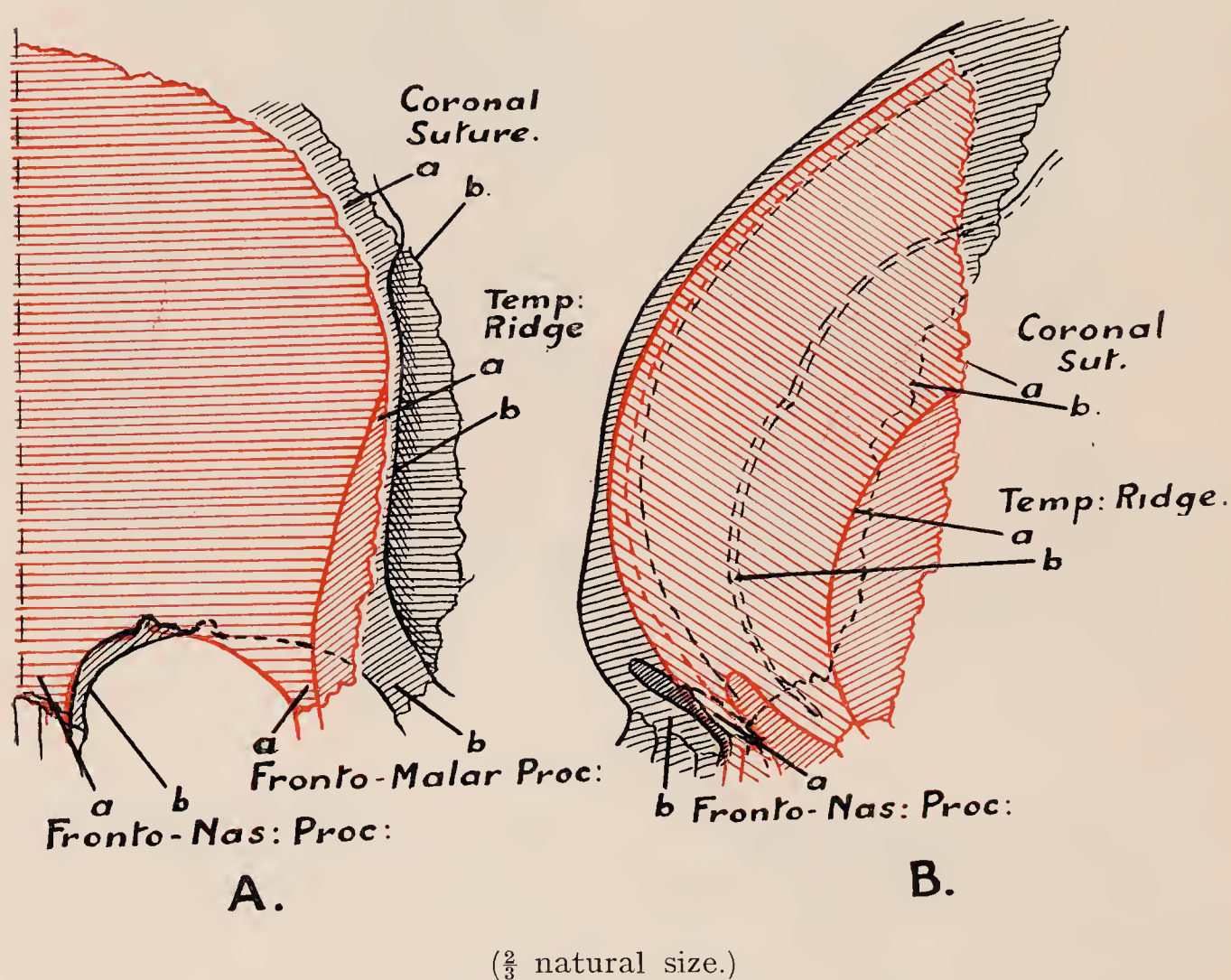


FIG. 9.—A: The anterior aspect of the left half of the frontal bone of a child of 5 (a) superimposed on the left frontal of an Englishman with normally developed jaws (b). The bones are superimposed so that points on their inner or cerebral aspect coincide. B: The same bones seen in profile and superimposed according to internal markings.

In Fig. 9A is shown the frontal bone of a child, aged 5 years, seen on its anterior aspect and superimposed on an English adult with well-developed jaws, the superimposition being guided by internal or cerebral markings. It will be observed that the internal angular or fronto-nasal process of the frontal has new bone deposited on it to the thickness of 3-4 mm. from the 5th to the 25th years. The inter-orbital prop is increased in width or thickness by 6 or 8 mm. of new bone. New bone is also laid down on the supra-

orbital margin. The changes at the outer end of the supra-orbital bar (Fig. 9A) are much more extensive and important. The external angular or malar process of the frontal is moved outwards by a process of growth during the 5th-25th year period to an extent of 15 mm., becoming stronger and more massive as it reaches its adult position. The process involved is the usual one—absorption on the mesial aspect of the process, deposition on its outer or lateral aspect. Thus the width of the supra-orbital bar, measuring about 78 mm. in the 5th year, becomes 30 mm. wider before the adult stage is reached in a modern robust-faced Englishman. These growth changes are correlated with others which take place in maxillæ and malars.

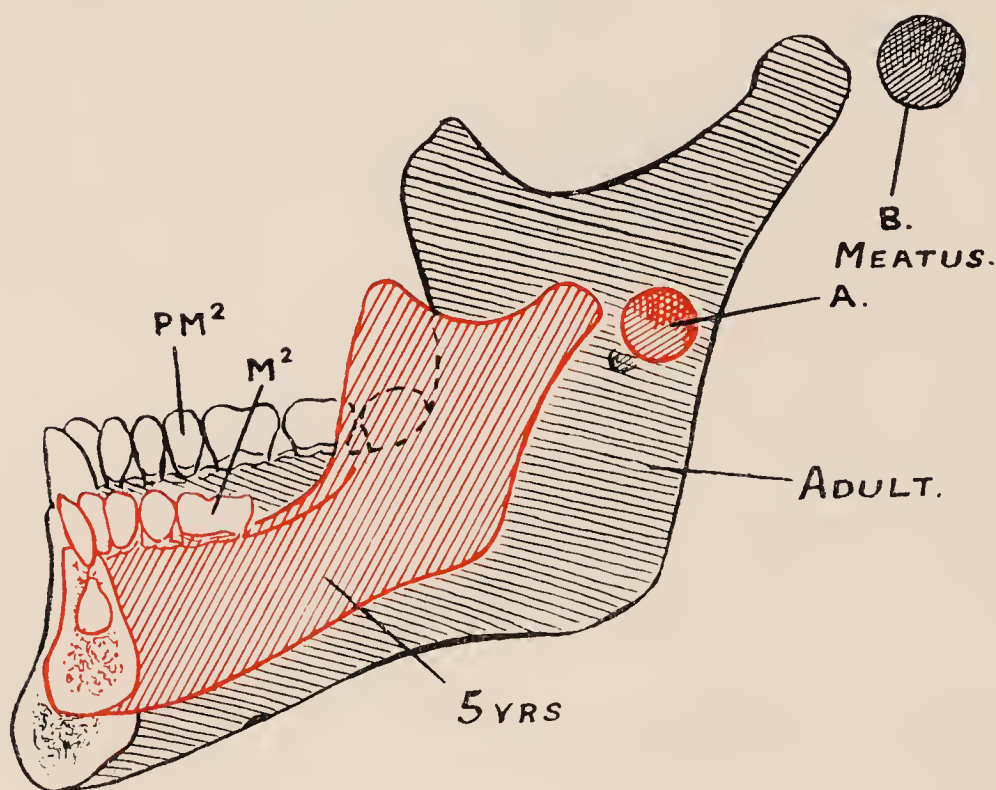
Still more remarkable changes are to be observed in the frontal when mature and immature stages are viewed in profile (Fig. 9B). Here the bones have been superimposed so that points on their internal or cerebral surfaces coincide. The forward movement of the nasion and naso-glabellar region is again shown; the importance of this growth movement in adding to the E line has already been mentioned; in this case the movement in the 5th-25th year period is represented as 12 mm. We might have reproduced here superimpositions of the frontal bone of an acromegalic and normal man to show that the growth changes in the fully-formed frontal are of the same nature and degree as those represented in Fig. 9B in the youthful growing frontal bone. The profile tracings show that there is a forward movement of the malar process of the frontal during the later years of growth. This is correlated with the forward extension of the temporal muscle on the frontal bone throughout the 5th-25th year period. In Fig. 9B, the temporal line or ridge in the adult frontal lies 14 mm. in advance of the position occupied in the child. But besides these local changes in the supra-orbital bar and temporal ridges there is a rotatory movement of the frontal as a whole during the later years of growth. This rotatory movement, which varies much in its extent, is brought about by growth changes along the coronal suture. In the 5th-25th year period new bone is rapidly added to the upper part of the frontal bone—at the margin entering into the upper part of the coronal suture (Fig. 9B), while in the lower, the part of the suture covered by the temporal muscle, the opposite is happening: bone is being removed from the frontal edge, while the parietal edge extends forward. In this manner the lower or temporal segment of the coronal suture is advanced towards the forehead in the later years of adolescence. All of these frontal transformations are part of the mechanism of face and jaw growth. We have already drawn attention to the great coronal system of growth sutures—the “coronal complex.” If growth of the upper face is abnormal the fault is to be sought for in some part of this complex—in the pterygo-maxillary part, temporo-malar, spheno-ethmoid, palato-maxillary, spheno-frontal, or in some part of the coronal suture proper. Normal growth implies that the process of bone growth all along this complex is proceeding in an orderly manner.

GROWTH IN THE MANDIBULAR REGION.

We have now finished with the mechanism of growth in the upper face—at least so far as concerns its extension in a forward and vertical

direction. Before proceeding to discuss growth in the mandibular region of the face we should like to express our conviction that the growth of the upper face is not only of much greater complexity than is mandibular growth but that the upper facial growth is the "pace-maker," as it were, to which the lower or mandibular mechanism has to adapt itself. There must be a mechanism for harmonising growth at all sites where new facial bone is laid down but we suppose that an essential part of this mechanism must be one which adapts mandibular to maxillary growth. It is not necessary to point out that whatever the nature of this growth co-ordinating mechanism may finally prove to be, it is one very liable to be upset under modern conditions of life. Here, too, we may state our belief that in the lower jaw, just as in the upper, we have to distinguish the alveolar bone as constituting a separate growth element, differing in its reactions and nature from the supporting framework of bone on which the alveolar element is set. From remote times anatomists have known that this alveolar element is absorbed and completely disappears with the removal of the teeth. Its life and reaction depend on the presence of the teeth. Sir Frank Colyer has shown that in lower vertebrates the alveolar element in the mandible may be demarcated from the supporting element by sutural lines. In the adaptation of lower to upper teeth it is the alveolar bone element which reacts and brings about apposition. Alveolar spongy bone is peculiarly sensitive to the pressures and stresses brought to bear on it in the course of mastication.

Line G (Fig. 1) represents the distance of the mental eminence from the mid-point of the trans-meatal axis. In Fig. 10 are given the growth elements crossed by this line. The mesial aspect



($\frac{2}{3}$ natural size.)

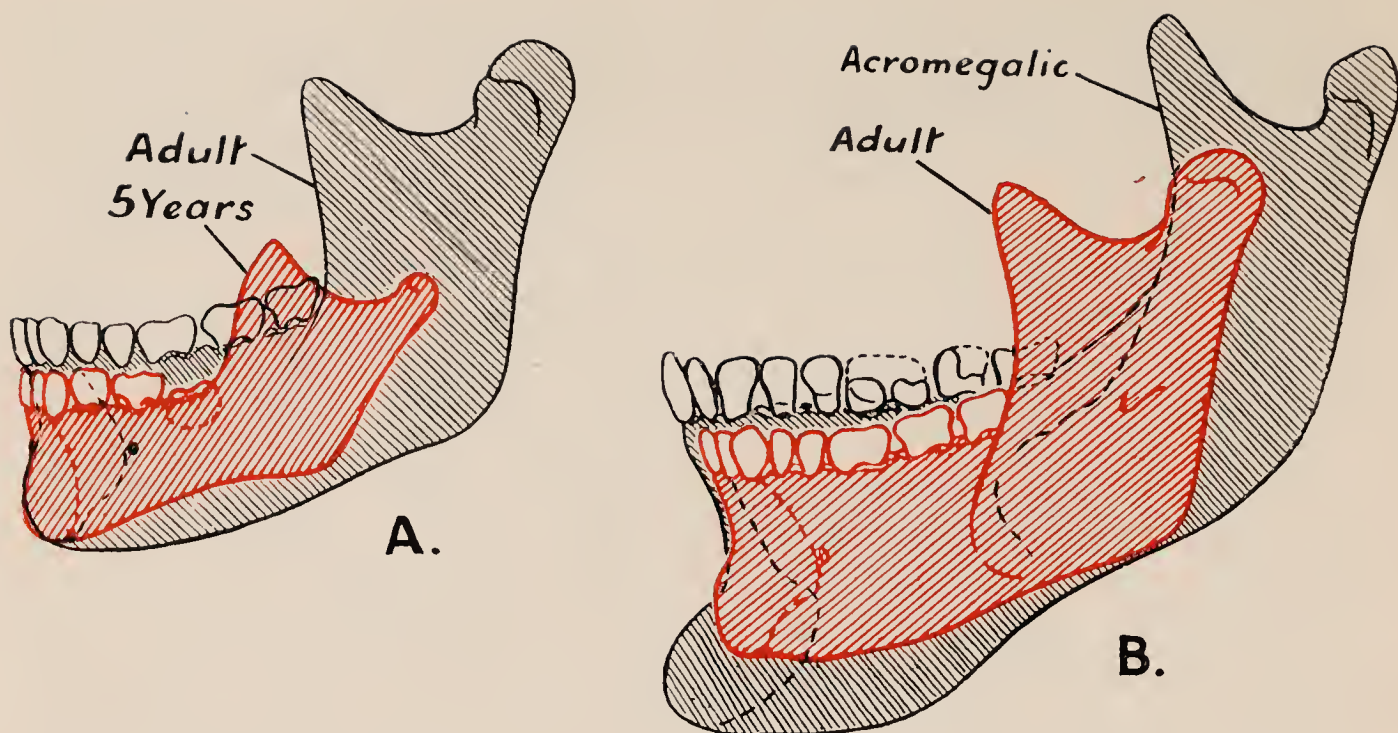
FIG. 10.—Mesial aspect of mandible of a child 5 years (A) superimposed on corresponding points of adult male (same specimens as are represented in Figs. 2, 3, etc.).

of the mandible of a child of 5 years has been superimposed on corresponding points of an adult mandible—the difference between the two representing the growth changes which are effected during the 5th-25th year period. The position of the mid-meatal axis is shown in each specimen. In the child, the “G” line measures 84 mm., in the adult, 132 mm.; the line, as indicated by these isolated samples, has been extended 48 mm. in 20 years. Of the 48 mm. thus added, 40 of them have been obtained by condylar growth—by the deposition of bone under the cartilage covering the upper and posterior aspects of the condyle. The remainder—some 8 mm. has been obtained by bone deposited on the lower and anterior aspect of the chin, thus deepening the mandibular symphysis and extending it forwards. These calculations are based on the belief—by no means well supported, that there is no forward migratory movement of the mandibular alveolar element—the element which carries the mandibular teeth—but that the buds of the premolar teeth rise up and occupy the same relative position in the mandible as the milk molars did in the young child. The superimposition on Fig. 10 is based on the truth of this belief.

In Table I the mean distance of the mental or lower chin point from the mid-meatal point is given as 119.9 mm.; at the 10th year, 98.6 mm.; the chin is thus advanced 21.3 mm. in a forward and downward direction during the course of about 10 years. It is a notable fact that the advance is much more rapid after the 16th year than before it. While the advance is but 5.7 mm. between the 10th and 16th years, it is 15.6 mm. between the 16th and 21st. Table I also shows that the distance is much less stable—shows greater degree of fluctuation after than before the 16th year. It will be remembered that the same high variability characterised the later stages of maxillary growth.

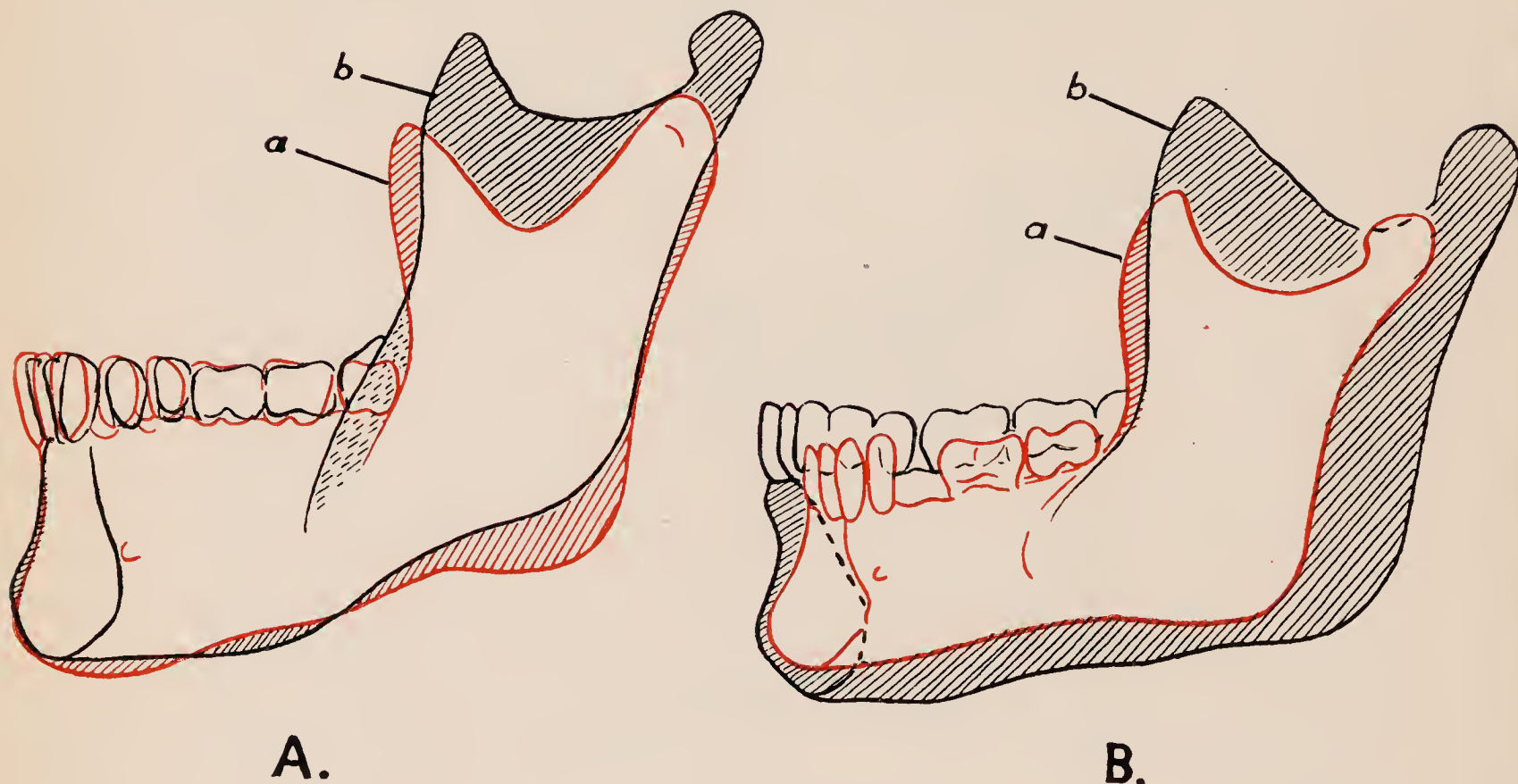
In Fig. 11 other figures are given to illustrate the mechanism of mandibular growth. In Fig. 11A the mandible of a 5-year child is superimposed on that of a robust-faced Englishman, while in Fig. 11B, the same adult mandible is placed on the corresponding parts of the subject of acromegaly. In both figures the growth changes are seen to be of the same nature—of the same relative extent. These figures bring out the different behaviour or reactions of the alveolar and of the supporting bone. In the acromegalic both elements react by growing, particularly the chin or supporting element which receives a pronounced enlargement. The special growth and prominence of the chin and supporting mandibular element in acromegalics are to be explained by the enlargement of the tongue and mouth musculature. The supporting framework of the mandible serves the uses of these muscles as well as the needs of the teeth. In the majority of acromegalics only the mandible responds to growth; the alveolar element of the maxillæ may not be affected; this we regard as due to the ease with which growth is set up under the condylar cartilage of the mandible.

The value of the length of the line “G,” from a functional point of view, depends on the length of the face—the distance of the chin from the nasion. This is brought out by the two mandibles, both of Englishmen, superimposed in Fig. 12A. In the specimen labelled *b*, the distance of the chin point from the mid-meatal is 130 mm.; in *a*, the better-formed mandible, it is only 115 mm. The specimen



($\frac{1}{2}$ natural size.)

FIG. 11.—A : Mandible of child aged 5 years, superimposed on mandible of adult male Englishman. These are not the specimens represented in Fig. 10. B : the adult jaw represented above, superimposed on the mandible of man who was the subject of acromegaly for over 15 years.



($\frac{2}{3}$ natural size.)

FIG. 12.—A : The mandible of a man with narrow, deeply arched palate (b) superimposed on a specimen from a man with normal palate (a). B : the mandible of a woman (a) superimposed on that of a man (b) to show the difference in development of all three elements of the mandible—alveolar, supporting, and muscular or ramal. There difference depends on the growth influence of the sexual glands.

“ b ” is from a man who had a narrow but deep palate, with long contracted face, the chin being 130 mm. distant from the nasion, whereas specimen “ a ” is from a man with a well-formed palate and facial length of 115 mm. In “ b ” it is seen that the angular or masseteric region of the mandible is ill-developed; the deep development of the alveolar element of the upper jaw has led to the body of the mandible being pressed downwards, so that the body of the mandible is laid down at an open angle to the ascending ramus, the mandible has the appearance of having been laid down with the mouth kept in a gaping position. Here we have an increase in the G line due to an abnormality in the growth of the upper face. In Fig. 12B, the growth of a woman's and man's mandible are contrasted. The male outstrips the female in all three elements—the alveolar, supporting and muscular or ramal. As in acromegaly we see herein the influence of the hormone system on growth control.

We have said very little concerning the growth of the mandible; this is the only bone of the face in which the mechanism of growth has been studied in detail hitherto. Figures 10 and 11 illustrate where new bone is laid down and where old bone is removed. We would just add a word or two here as to the part taken by mandibular growth in adding to the length or vertical height of the face. In the symphysial region, as is illustrated in Fig. 10, 17 mm. is added to the vertical height of the face during the 5th-25th year period. In the samples chosen in Fig. 10, line D (see Fig. 1, Table I) measures 25 mm. at the 5th year and 42 mm. in the adult. Table I shows that the “ D ” line has a mean height of 35.8 mm. in the 10th year, 40.8 mm. in the 16th and 44.4 mm. in the adult, the increase being 5 mm. in the 10th-16th year period and only 3.9 mm. in the 16th-21st year period. In the general development of the face the increase in height of the ascending ramus is of importance. From the sample shown in Fig. 10 one infers that the ascending ramus adds 28 mm. of new bone to its height in the 5th-25th year period.

THE GROWTH-MECHANISM CONCERNED IN GIVING WIDTH TO THE FACE.

So far we have been studying the sites at which new bone is laid down to give an extension of the face in forward and in downward directions; we now proceed to examine how the face expands in width—the most important direction to secure a normal development of the parts concerned in mastication. From observations made by one of us (A. K.) on prehistoric English skulls we are convinced that in a considerable proportion of the modern population of Britain there is a tendency for the face to become longer and narrower. This tendency is directly related to narrowing and arching of the palate. Bony matter is apparently laid down to about the same amount in these long contracted, hatchet faces as in the shorter, wider, more primitive prehistoric faces, but from some alteration in the mechanism of growth new bone which was formerly laid down to add to the width of the face is, in a large proportion of present-day people, deposited so as to increase the length at the expense of the width. With this reduction in width comes a pinching of the facial skeleton from side to side leading to the irregular projection of points situated in the middle line of the face—between the nasion above and the chin below (see Fig. 1).

The mechanism concerned in the increase in width of the supra-orbital part of the face—about 30 mm. in amount during the 5th-25th year period—has been illustrated in Fig 9A and discussed in the text accompanying that figure. We shall proceed here to discuss the mechanism involved in widening the infra-orbital region of the face, the region which is made up of maxillæ, malars and nasals, and which enclose the nasal cavities. The hard palate is the central and essential part of this region of the face.

In Fig. 13A is represented from the front the infra-orbital part of the face of an Englishman with a well-formed palate—width between the outer margins of crowns of 2nd molars=62 mm.—and the distance of the zygomatic arch from the mesial sagittal

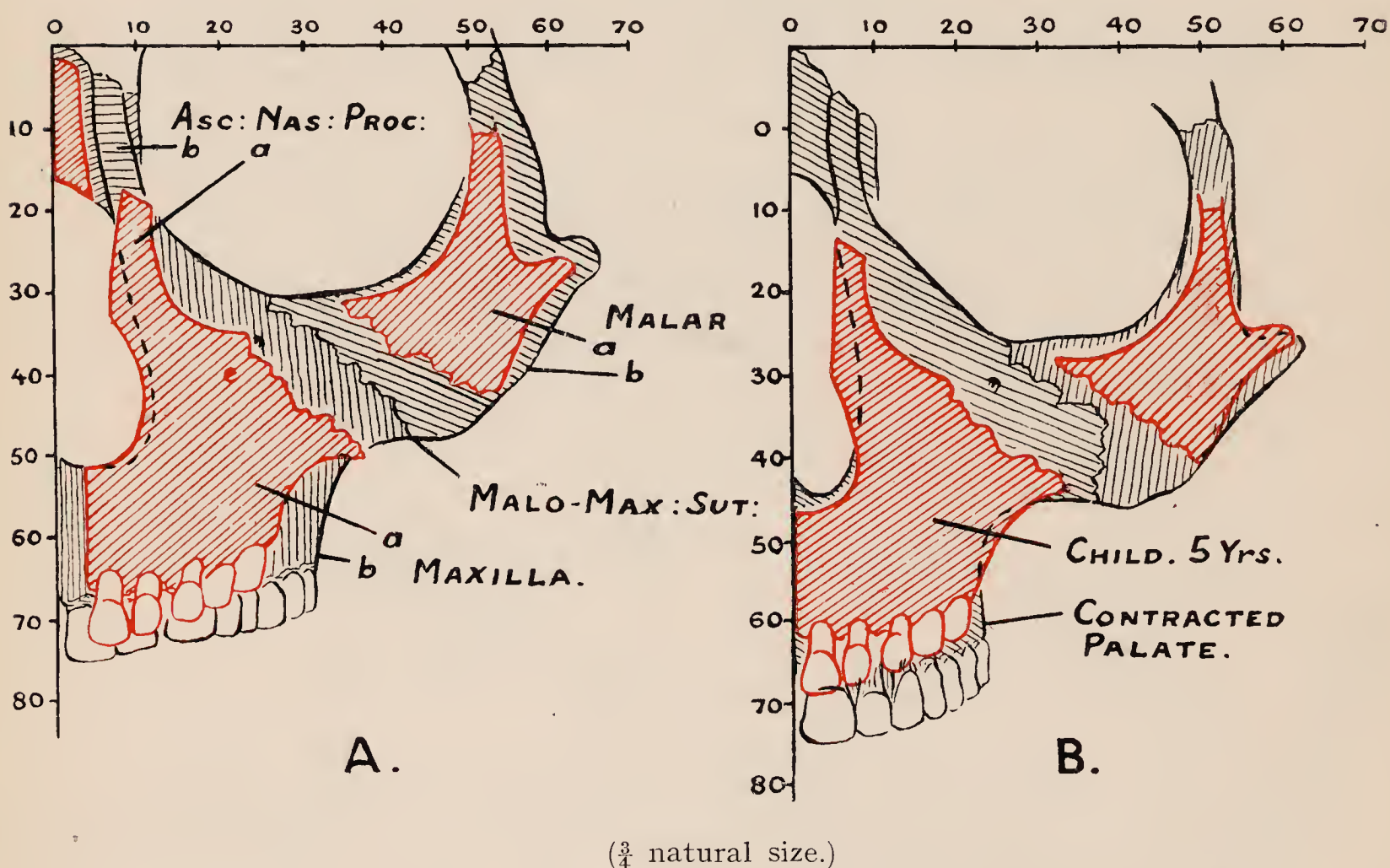


FIG. 13.—A: The left maxilla malar and nasal bones of an Englishman with wide palate and robust, symmetrically developed face, represented on their anterior aspects. On these adult bones have been placed those of a child of 5 years, superimposed so as to bring out the areas of bone growth during the 5th-25th year period. B: The same bones of an Englishman with narrow, deeply-arched palate, long hatchet face. On them have been superimposed the same child's bones as are represented in Fig. 13A.

plane of the skull being 66 mm.—the bi-zygomatic width 132 mm. In the skull of the child, aged 5 years, the width between the outer margin of the second milk molars is 42 mm. while the zygomatic arch stands 49 mm. from the sagittal mesial plane—the bi-zygomatic width being 98 mm. In the samples chosen the bi-zygomatic width of the face increases from 98 mm. to 132 mm.—an addition of 34 mm. during the 5th-25th year period. Where is this new bone laid down? A glance at Fig. 13A will show that we believe the greater part is laid down on each side of the malo-maxillary

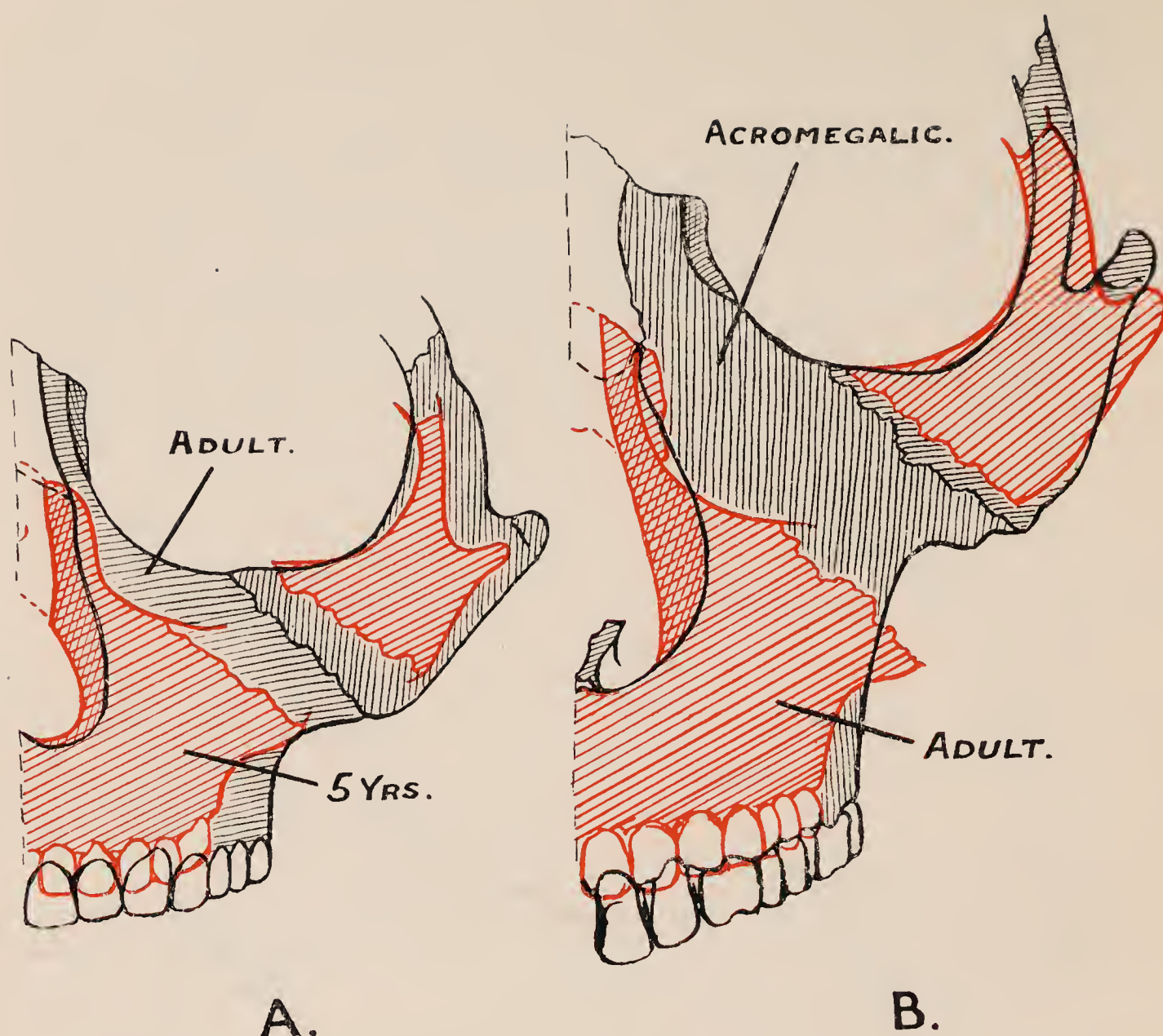
suture; the addition made at this suture represents an increase of 10-11 mm. of new bone on each side, giving 20-22 mm. of the 34 mm. of total increase. There is new bone laid down on the lateral aspect of the malar and zygomatic arch giving an addition of 3 or 4 mm. on each side. It is to the third site we would particularly direct attention—the intermaxillary and internasal sutures. So far we have met no mention by previous investigators that they regarded the mesial suture of the palate, passing from nasal spine in front to the palatal spine behind, as an important growth suture. It is when we come to explain the widening of the nasal floor during the years of growth and the corresponding widening of the palate, and to account for the growth movements which can be demonstrated, that we become convinced that new bone is laid down in the intermaxillary suture. As depicted in Fig. 13A we believe that the normal increase at this suture during the 5th-25th year period is about 8 mm. in width—4 mm. on each side. We shall come back to the point in discussing growth of the palate.

In Fig. 13B is represented the infra-orbital face of an Englishman with narrow, deeply-arched palate (the distance between the outer or buccal surfaces of the second molar crowns was 48 mm., between their inner surfaces 27 mm.), with long hatchet-face and fallen-in cheek bones. On his face has been superimposed the bones of a child of 5 years of age, the same as are represented in Fig. 13A. There has been apparently no growth in the intermaxillary suture or on the lateral aspect of the zygoma after early childhood. There has been growth at the malo-maxillary suture but of an irregular nature, particularly on the malar side of this line. The malar instead of expanding in a lateral direction has tended to spread in the direction of the pull exercised on it by the masseteric muscle. The alveolar element in place of expanding laterally has spread downwards, in a vertical direction. The ascending nasal process of the maxilla and the frontal process of the malar are particularly long, giving the modern orbit its great depth. We have here a marked disturbance in the normal process by which the face expands in a lateral direction.

In Fig. 14 the process of normal growth of the face is contrasted with that seen in acromegaly. In Fig. 14A is represented the growth changes during the 5th-25th year period, but in this case the child's maxilla has been superimposed as if no growth took place at the intermaxillary suture. In Fig. 14B the bones of the adult shown in Fig. 14A have been superimposed on the infra-orbital face of a man who was the subject of acromegaly for 15 years. The mechanism of growth which is seen at work is the same as that seen in youth, only of an irregular kind. The irregularities seen in Fig. 14B, so far as their nature is concerned, are not unlike those which affect the contracted face, represented in Fig. 13B.

STUDY OF FACIAL GROWTH AS SEEN ON THE BASE OF THE SKULL AND PALATAL ASPECT OF THE FACE.

In the study of the growth of the face the approach which gives the most instructive results is by a route not possible in the living—only in dried macerated skulls. The approach is that depicted



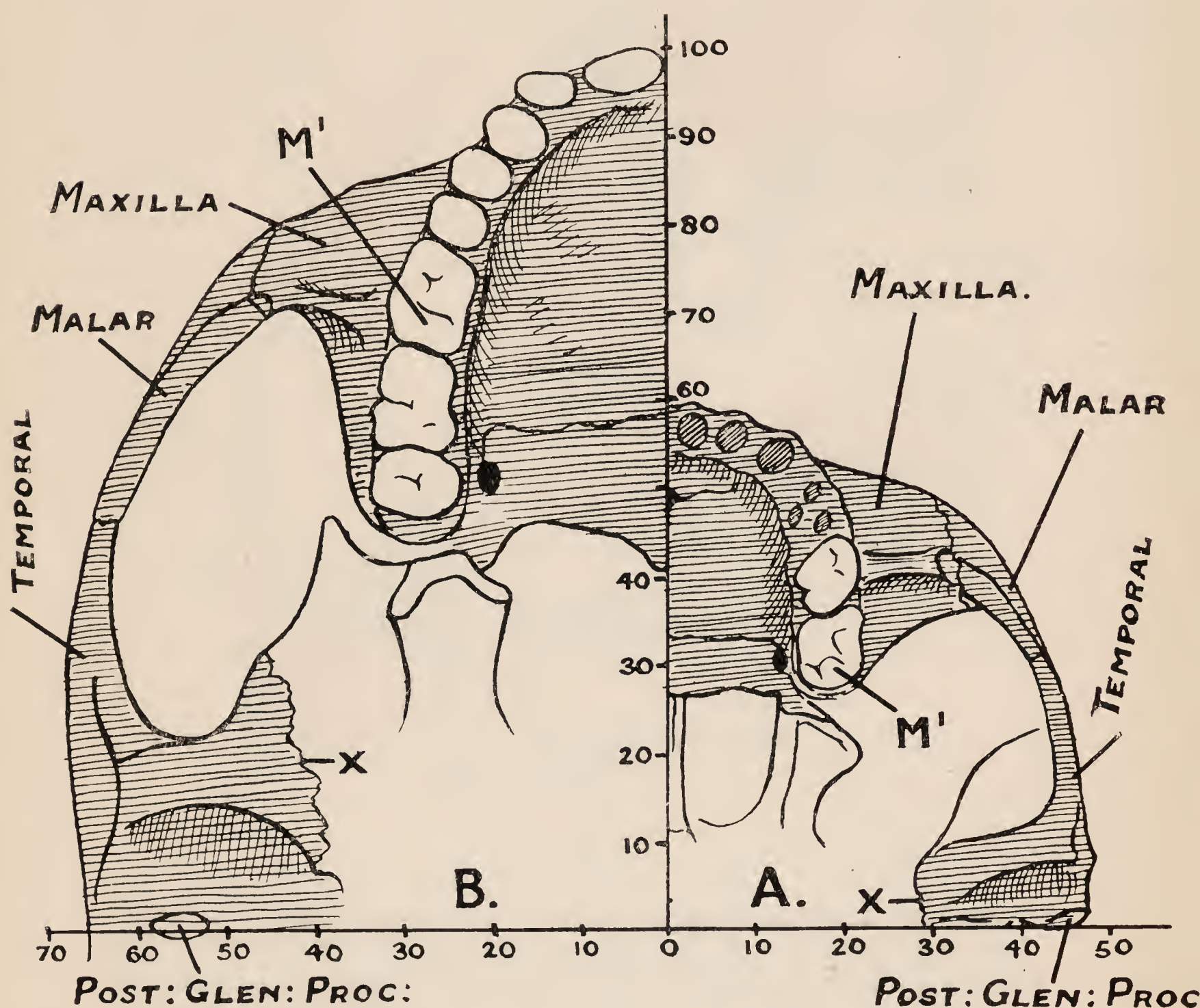
($\frac{3}{4}$ natural size.)

FIG. 14.—A: The infra-orbital part of the face of an Englishman (A), with bones of a child of 5 years superimposed to compare with the infra-orbital part of the face of a subject of acromegaly. (B): on which the bones of a normal adult have been superimposed.

in Fig. 15 where the basal aspect of the palate is drawn—the drawing being made on a plane represented by the premolar and molar parts of the alveolar margin of the palate. The zygomatic arches are also included; so are the maxillæ. The post-glenoid spine, which marks the posterior limit of the masticatory area on the base of the skull, is taken as a base line, from which the forward movement of parts is estimated during the growth of the face (line shown in Fig. 15). In Fig. 15A the state of matters is that reached at the completion of the milk dentition and during the formation of the first permanent molar in the 4th year of life. The problem we have to solve is: how does a palate such as that represented in Fig. 15A, become the adult palate depicted in Fig. 15B? The drawing shows that in the 4th year the incisor alveolar margin lies 60 mm. in advance of the post-glenoid base line; in the adult it is 100 mm. in advance. In the 4th-25th year period this part of the palate is advanced 40 mm. What is the mechanism involved? In the child's face (Fig. 15A) the zygomatic arch is 47 mm. from the mid-line; in the adult it is 68 mm., an increase of 21 mm. How is this extension obtained? Further, a very important

point, the outer edge of the great wing of the sphenoid, the speno-temporal suture (x, Fig. 15) just mesial or internal to the temporo-maxillary joint is 27 mm. distant from the mid line in the child but it is 38 mm. distant in the adult. The growth of the face is attended by a pushing outwards of the region of the temporo-maxillary joint—the movement depending on the growth of the great wing and body of the sphenoid.

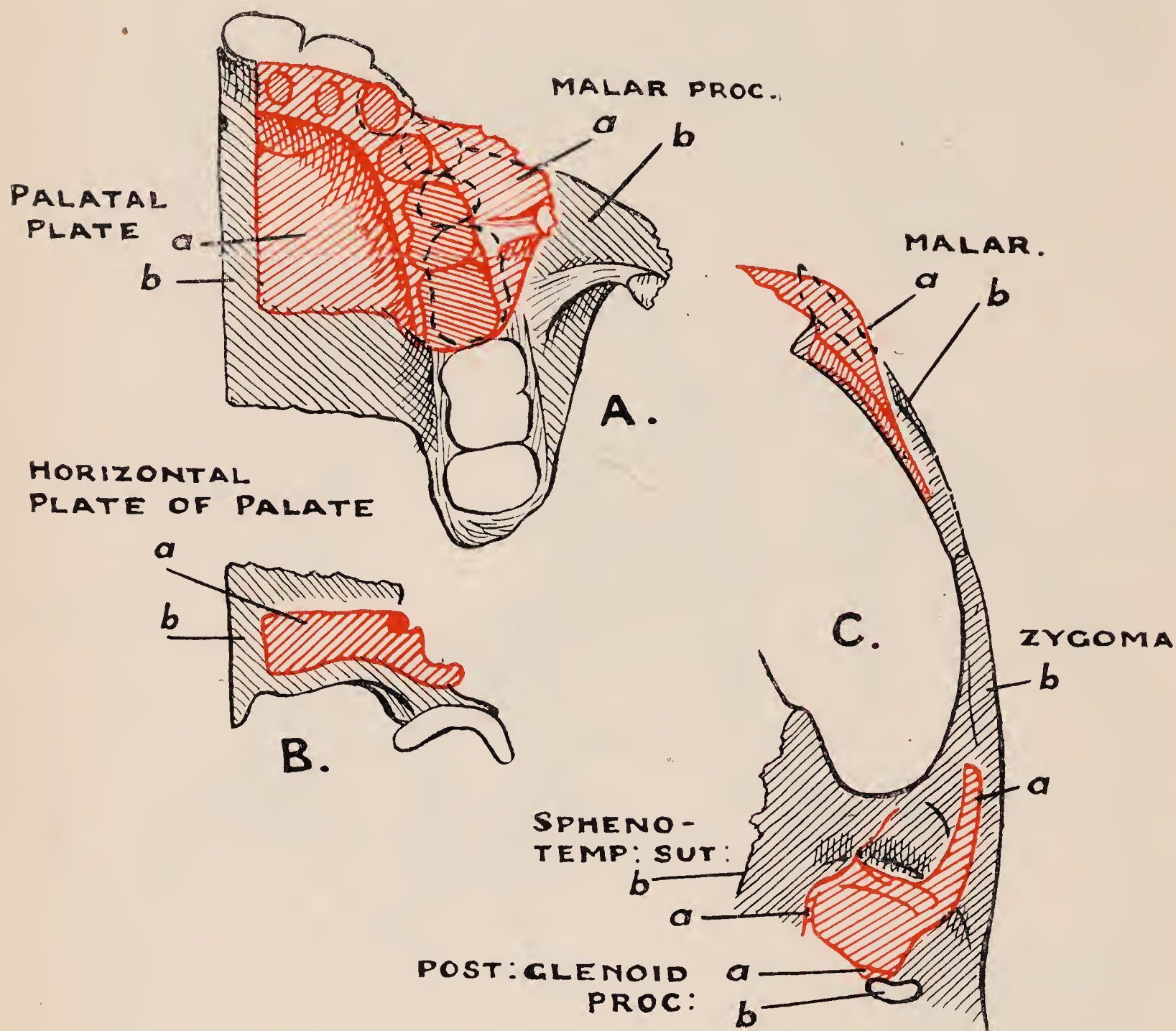
In Fig. 16 a, b, c, an analysis is given of the sites at which new bone is laid down from the 4th to the 25th year. In Fig. 16 the maxilla and the palate represented in Fig. 15A (a younger stage than has been used in previous illustrations) have been super-



(Natural size.)

FIG. 15.—A : The left half of the palate and zygomatic arch of a child in which the milk dentition is completed and the crown of 1st permanent molar is forming; about 4 years of age; drawn on the plane of the alveolar margin. The base line crosses the post-glenoid spine. B : the right half of the palate and supporting zygomatic arch of an adult Englishman, with well-developed palate and jaws. The base line CC passes through the post-glenoid spine. In the adult, the post-glenoid spine forms the anterior boundary of the meatal passage ; it lies 4 mm. in advance of the mid-meatal point.

imposed on the adult maxilla and palate represented in Fig. 15B. As near as possible the alveoli of the milk teeth have been placed over the corresponding alveoli of the adult palate. To obtain this superimposition it will be seen that it has been necessary to



(Natural size.)

FIG. 16.—The palates shown in Fig. 15 taken apart, and the individual parts superimposed. (A) The palate, alveolar margin and maxilla of “a” a child aged 4 years, superimposed on the same parts of the adult “b.” (B) The palate bone of the child superimposed on the palate bone of the adult, the orientation being guided by the position of the posterior palatine canal. (C) The temporo-mandibular region with the parts of the zygomatic arch superimposed on the corresponding parts of the adult.

assume a growth at the intermaxillary suture; as previously stated we believe that about 4 mm. of new bone is added at each side of this suture during the eruption of the permanent dentition. Besides there is, or should be, also a lateral and forward growth

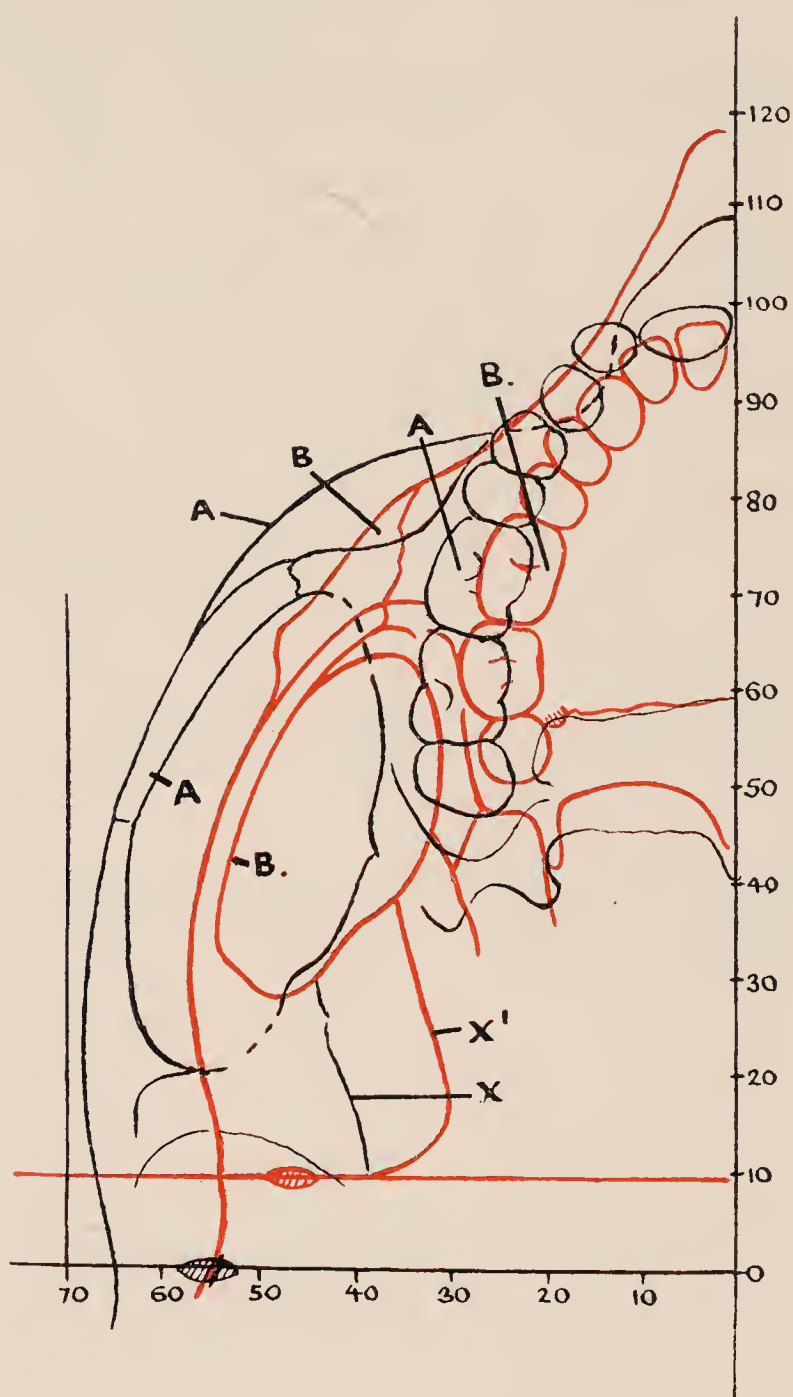
of the alveolar element of the maxilla ; 21 mm. of new bone has been added to the alveolar arch to carry the sockets of the 2nd and 3rd permanent molars. The maxillary palate has been extended backwards at the transverse palatal suture, 11 mm. of new bone being thus added. It will also be seen from Fig. 16A that the malar or cheek part of the body of the maxilla has been extended laterally 10 mm. by growth at the malo-maxillary suture, and at the same time has been moved backwards by remodelling, so that the malar process, instead of lying in line with the 2nd milk molar, comes opposite to the first permanent molar. The forward extension of the palate is largely the result of interpolation of new bone on the maxillo-palatal part of the great coronal sutural complex.

In Fig. 16B, the growth of the horizontal plate of the palate is depicted ; if the posterior palatine canal may be regarded as fixed during growth then addition is made to both anterior and posterior borders of the horizontal palatal plate.

During the eruption of the permanent molar teeth the temporo-mandibular area of the base of the skull is revolutionised—particularly during the later stages of dental eruption. Not only are the articular surfaces altered in shape and extended in size, as shown in Fig. 16C, but new bone is added at both margins of the temporal bone ; on its mesial side, about 6 mm. of new bone is added in the speno-temporal suture (see Fig. 16C) and a like amount at its lateral border. All the time, too, the temporo-mandibular region is being pushed laterally by increase in the width of the sphenoid bone—by new bone being laid down on the sphenoid side of the speno-temporal suture (see Fig. 15). There is no need to again draw attention to the extensive interpolation of new bone in the temporo-malar suture of the zygomatic arch, nor to the growth of the malar itself. Thus it is seen that the 40 mm. which the incisor part of the maxilla moves forwards from the 4th to the 25th years, depends on new bone being laid down in the temporo-mandibular region of the temporal bone ; to new bone interpolated in the zygomatic arch, to new bone interpolated at the posterior end of the alveolar arch and transverse suture of the palate and to new bone deposited on the anterior or labial aspect of the alveolar margin of the maxilla.

Fig. 17. That the narrow deeply-arched palate is not a single defect in an otherwise well-developed face, but part of the failure in the general growth of the face, will be seen from the comparison made in Fig. 17. Here we have placed an exact drawing of the right half of the temporo-palatal region of a prehistoric Englishman, one with well-spread palate and a full and robust development of jaws, as was the rule in the prehistoric Britons. On this well-developed ancient face we have placed the corresponding parts—drawn like the first on the alveolar plane—of a modern Englishman with long narrow face, contracted palate, and imperfectly grown jaws—a representative of the “adenoid faces”. The molar teeth of the modern skull will be seen to fall 5 mm. inside the corresponding teeth of the ancient skull ; it is so also with the canine and incisor teeth. We regard the defective or diminished spread of the palate in the modern skull as being due, in the main, to a failure of bone growth along the mid-line suture of the palate—the intermaxillary suture. The lower end of the malo-maxillary suture, marking the anterior limit of the origin of the masseteric muscle, lies 10 mm. further outwards and forwards in the ancient than in the modern

skull. The lateral spread of the ancient zygomatic arch is 11 mm. greater than in the modern. In the region of the temporo-mandibular joint we see even greater differences between the growth of the modern and ancient skulls. Mention has already been made of the growth of this region and its migration outwards or in a lateral direction owing to the expansion of the great wing of the sphenoid in the later stages of molar eruption. It will be observed that the outer edge of the great wing of the sphenoid on the modern skull (Fig. 17 x) lies 8 mm. internal to and in advance of the corresponding point (x) of the ancient skull. Further it will be observed that the post-glenoid spine in the modern skull lies 8 mm. in advance of and 8 mm. mesial or internal to the post-glenoid spine of the ancient skull. This indicates that the forward movement of the



($\frac{3}{4}$ natural size.)

FIG. 17.—Left half of temporo-maxillary region of skull of prehistoric Englishman (A) with primitive, well-developed palate and jaws, drawn on the plane of the alveolar margin. On this primitive palate is placed that of a modern adult Englishman (B) in which the face was narrow and elongated, the palate contracted and the jaws imperfectly grown.

whole palatal bony scaffolding of the modern skull has been arrested and that the naso-pharyngeal space has been restricted by a failure in the mechanism of facial growth.

Further evidence as to the nature of the defective growth of the face so common among modern Englishmen and particularly Englishwomen will be gleaned from an examination of the careful drawings reproduced in Fig. 18. On one side of that drawing is

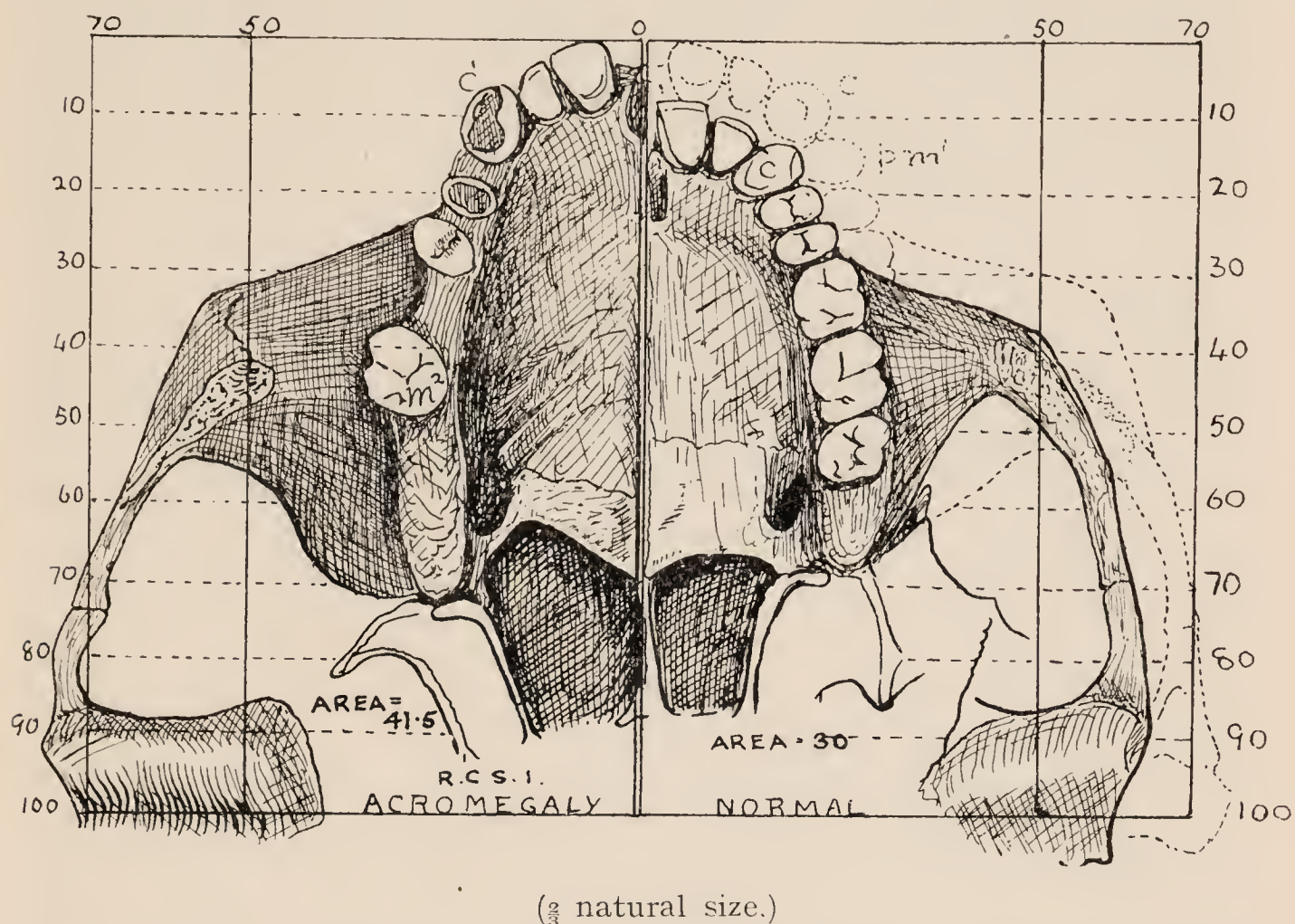


FIG. 18.—Right half of the temporo-palatal region of a subject of acromegaly, compared with the corresponding region of a normally developed skull of a modern Englishman. Round the drawing of the normal palate are shown in stippled lines the dimensions of the acromegalic palate and zygomatic arch.

depicted the zygomatic arch, maxilla and palate of an Englishman who was the subject of acromegaly for many years—one of these cases where overgrowth affected the maxillæ as well as the mandible. Side by side with this drawing is set the corresponding parts of a well-developed skull of a modern Englishman. The difference between the acromegalic specimen and the normal one is of the kind shown in Fig. 17 in which the ancient, well-developed and modern contracted palates are compared. The differences are those which result from an arrest or a disorder of the mechanism of growth. With the disordered enlargement of the pituitary we have a disorderly growth of all the parts concerned in mastication.

SUMMARY OF RESULTS

In this paper we believe we are opening out a new chapter in our knowledge pertaining to the mechanism which transforms the face of the child into that of the adult. We have merely dealt with the general nature of the growth-machinery involved; we are fully conscious that a long and laborious investigation is needed

to elicit the exact details relating to the changes which occur at each year of a child's life ; further observations on both living and dead are needed. But we have shown enough to convince everyone that the so-called "adenoid face," the narrow, deep palatal arch, the irregular eruption of teeth, are not due to a simple mechanical cause such as the presence of enlarged tonsils, or of adenoid vegetations in the respiratory tidal way. We are dealing with an arrest or a disturbance of the elaborate machinery which underlies facial growth. We have produced evidence showing that this mechanism is influenced by the functional state of the pituitary and of the sexual organs. We regard enlargement of the tonsils, the growth of adenoid vegetations in the naso-pharynx, and disordered or irregular growth of the jaws and face as manifestations of a single pathological state. What the exact nature of this underlying pathological condition may be we are not yet in a position to decide, but when we keep in mind the close relationship there is between bone-formation and bone-growth, and the action of the glands of internal secretion on the one hand and the frequency with which a hypertrophy of the lymphoid system is accompanied by a defective formation of bone on the other, it is not difficult to believe that irregularities of the jaw and the development of adenoids may result from a nutritional disturbance. The explanation may come through the kind of research now being conducted by Colonel McCarrison, who has shown that a diet deficient in certain vitamine constituents will affect the normal working of the hormone growth systems of the body. Vitamines appear to act directly on the glands of internal secretion. We suspect that the defects which are so frequent in the growth of the English, or rather Nordic, face may ultimately prove to be the result of some deficiency or error in the dietary on which our infants and youths are reared. No doubt, too, our modern dietary is of a kind which leaves teeth, jaw and muscles of mastication imperfectly exercised. The physical stimuli which are necessary for the normal growth of bone are missing. This, too, may be a factor in gnathic degeneration.

The PRESIDENT said that everyone present had listened with the very greatest interest to the paper which Sir Arthur Keith and Mr. George Campion had submitted, which he thought all would agree, was marked by that ability which one had reason to expect from two such keen and accurate workers. To Mr. Campion the Society was indebted for many contributions to its transactions in the past, as it was also to Sir Arthur Keith. Although Sir Arthur had said that the paper was only a beginning of the subject, the members would agree that it was a very fine beginning indeed. (Applause.)

Mr. N. G. BENNETT wished to express briefly, in addition to what the President had said, the gratitude the Society felt, not only for the brilliant exposition to which the members had just listened, but also for the fact that it had been made before the Society, because their transactions would now be sought for, not only by those bodies mentioned in the Secretary's report, but by every scientific society in the world. (Applause.)

He would like to ask Mr. Campion one or two questions. Some years ago he had started, rather chaotically, to try and make some investigations on the lines of those Mr. Campion had carried out, and he found, when working with the living subject, considerable difficulty in getting accurate measurements through the soft parts, so as to compare one person with another. Possibly Mr. Campion had overcome that difficulty, or had found that the objections he had met with were not so important as he had supposed.

He had been particularly interested in what Sir Arthur had said with regard to the growth between the two halves of the maxilla. He thought that most people working clinically had never been able to convince themselves that the two halves of the maxilla united at the very early age which they were supposed, in some quarters, to do. As bearing on that, there were certain cases in America where, with expansion apparatus, at comparatively advanced ages expansion was shown to be so rapid that it was almost impossible to believe that it was simply due to absorption and redeposition of the alveolar margins, not to movement of the teeth, but to separation of the two halves of the maxilla. Radiographs were published showing that separation, and a wide space between which apparently became filled up ultimately with bone. Recently he had an example of that, not in his own practice, but in that of a dentist in Ireland, whom he had advised with regard to the case and to whom he had sent certain apparatus. That dentist worked the apparatus with such great facility and rapidity that within a comparatively short time—a few weeks, with a child over 10 years of age—he produced a separation which was equal, pretty nearly, to the width of a molar tooth. He knew that was a great deal to claim, but it was a fact, and models could be produced to prove it. That was convincing proof, he thought, that there was actual separation of the maxillae in cases of that kind.

There was one point concerning which he particularly desired to have Sir Arthur's opinion, namely, was all growth of the kind in question growth of the sutures, or was there any other kind of growth—interstitial growth. It was known clinically that between the ages of 2 and 6 the deciduous incisors did become, in a child of normal growth, very markedly separated indeed, and of course there were only two conceivable ways in which that could occur—by the tooth moving round sideways, which of course did not occur, or by it moving forward until it occupied a concentric circle larger than the one in which it was at first disposed. That separation did, of course, take place, and one did not see how growth of the bone could possibly account for it.

There was another point of a somewhat similar nature. Almost all the diagrams Sir Arthur Keith had shown exhibited, where the teeth were present, a deepening of the alveolar border. It was interesting to try and think when and how that deepening occurred, because he could not quite see how it occurred from the growth from any suture.

When the first permanent molars erupted they erupted to what was at that time the level of occlusion of the deciduous molars, and then, as it were, held their position while the deciduous molars changed and the upper molars came up, and they, again, adopted the same position the molars were in. Therefore, if there was a change, a lengthening (as no doubt there was), an increase in the depth of the alveolus, there must be a continuous growth after the eruption of the first permanent molars, so that the first permanent molars, which it was the custom to regard as permanent and fixed, apparently went on growing after that time. Therefore that deepening could not be due to any suture in the case of the mandible, and how, then, did it occur.

Mr. G. F. CALE-MATTHEWS said the fascinating paper which Sir Arthur Keith and Mr. Campion had presented merited far more consideration and discussion than time would permit of its receiving that evening.

In reply to the President Sir ARTHUR KEITH said it might be more useful if, before a discussion took place, the paper was printed and circulated and that it would afford him the greatest pleasure to be present on a future occasion, when the discussion took place.

It was then agreed to prolong the meeting sufficiently to allow of Mr. CALE-MATTHEWS exhibiting three slides, and he said that he would give no opinion on them, but simply submit them for examination.

The first was of a child who was deficient in many respects—the permanent laterals had not developed on the right side of the maxilla, and the bicuspid were absent on the right side. Temporary molars had erupted in two places. What was particularly interesting was that the slide showed normal vertical growth with the temporary teeth retained in a subnormal position. There had been a certain backward growth in the maxilla and there was excessive overbite.

The second slide showed two very similar cases which had, he thought, some bearing on what was said in the paper. They both showed cases of normal vertical growth with the temporary teeth remaining in subnormal position. The third and last slide showed radiographs of the same two cases.

PRESIDENT'S VALEDICTORY ADDRESS.

The PRESIDENT: The time has come for me to hand on to my successor the trust which you placed in my hands twelve months ago. When first I was called to occupy this chair, I came to it with feelings of considerable misgiving, but I have received such kindness from the members of this Society and such loyal support from your Council and its officers that I feel quite reluctant to say "good-bye."

Before leaving the chair, I desire first of all to place on record my keen appreciation of the devotion of your Council to the well-being of the Society and, in particular, I would mention the work done by your Treasurer and your Secretary. Upon Mr. Harold Chapman's shoulders falls the chief task in the management of our affairs, and only those who have had the privilege of working with him know how much he has done for the Society and how much he has sacrificed his own personal convenience in order to promote its interests. (Applause.)

At the commencement of the year, I expressed the hope that the Society might be able, in the near future, to accomplish three objects. The first was the strengthening of its organisation by securing a considerable addition to its membership. The second was to obtain better accommodation for our museum and library, so that specimens, diagrams, pictures and books might be housed under conditions whereby they may be easily accessible for study to all the members of the Society. The third object was to consider the question of education, both from the point of view of the student who is to become a general

dental practitioner and also that of the practitioner who intends to specialise in orthodontics.

There is an old French saying that when you cannot get what you would like, you must like what you can get. That represents a tendency of human nature which makes for contentment. I think, however, without being unduly optimistic, we have very good reason to feel satisfied with the work which has been accomplished by the Society during the past twelve months. From the reports that have been read this evening, you have heard that considerable progress has already been made in the attainment of these three objectives to which I have just referred. As our Honorary Secretary has informed you earlier in the evening, a considerable number of new members (thirty-seven in all) has been added to our roll. Our Curator has told you that the Council has decided to have a suitable museum case constructed for the exhibition of our specimens, and accommodation will be provided for the library. We hope to have this available for use during the early part of the coming year.

Then, with regard to education, two evenings of this session have been devoted to the discussion of this subject, and, moreover, a Sub-Committee on Education has been busy collecting information from the various educational bodies of the United Kingdom, and this Committee will make its report in the very near future, I believe.

It has been stated with reproach that the greater part of the literature of orthodontics has been devoted to treatment, and only the lesser part to subjects which seek to find out the etiology and pathology of these deformities. It is quite evident that until we know something of the causation and morbid processes of disease and deformities the treatment will be empirical rather than rational. But I do not think this reproach can be urged against the papers that we have listened to during the past session, and especially after the paper to which we have listened this evening, and I trust that the Society will always be foremost in seeking to discover the origin of the troubles which we meet to consider.

May I now appeal to every member to lend a hand in advancing the knowledge of orthodontics. Each one here to-night can do something to help the Society if he will. It may be only by collecting models or by keeping careful notes of the cases that he sees, or by introducing new members to add to our strength, but, whatever it be, let each of us do something.

The advancement of knowledge nearly always depends upon the assistance of many workers. All that even the best of our leaders can claim to do is to add a few bricks to the edifice of science which has been founded by our predecessors, and some of us are only able to keep the mortar ready for those greater workers to use in joining one brick to another. You and I will not be here to see the great building completed, but if, even in a very humble way, we have helped others to continue the building, we shall not have lived in vain.

In conclusion, gentlemen, I desire to express my warmest thanks to all those who have supported me so loyally and have made my year of office a real pleasure. And now, in vacating this chair, it is my privilege and honour to welcome Mr. Sidney Spokes as my successor. (Applause.) He is one whom the members of our profession delight to honour, for he has served us in so many ways and at all times with conspicuous ability. In welcoming him to take my place here, I know full well that he will add dignity and honour to this chair. (Applause.)

Mr. Lewin Payne then vacated the chair, inducting his successor, Mr. Sidney Spokes.

The PRESIDENT (Mr. Sidney Spokes) said he would reserve any lengthy remarks (and even they would not be very lengthy) for the January meeting. He merely wished to take the present opportunity

to thank the members for the honour they had done him. It was very kind of them to elect him to a chair which had been filled by so many good and eminent men. He thanked Mr. Lewin Payne, also, for the kind words he had spoken in inducting him into the chair.

The honour had come to him rather late, as he was no longer personally interested in the treatment of patients ; but that, perhaps, was a not unwise innovation, because he would be able to take a neutral view of opposing ideas.

The Society owed a great debt of gratitude, and should express its warmest thanks, to Sir Arthur Keith and Mr. Campion for the delightful paper they had presented that evening, and he proposed that a hearty vote of thanks be accorded to them.

The vote of thanks was carried by acclamation.

The PRESIDENT announced that the next meeting of the Society would be held on January 16th.

Mr. NORMAN BENNETT said that when he entered the room that evening he had been told by Mr. Chapman that, as a penalty for not having attended many meetings recently, the duty would be laid upon him of proposing a vote of thanks to Mr. Lewin Payne for his conduct in the chair and his valedictory address. He did not regard that as a penalty, however, but as a pleasure. He had known Mr. Lewin Payne for a long time and it always seemed to him that he exhibited that rare combination of amiability and efficiency which one looked for so often and found so seldom. (Applause.) Even without the experience he had had that evening, he would have known quite well that Mr. Lewin Payne would have conducted the meetings of the Society with very great success. Mr. Payne's valedictory address, to which they had just listened, though short had been very stimulating, and he was sure he voiced the opinion of the members when he asked them to pass a sincere and hearty vote of thanks to Mr. Lewin Payne for his conduct in the chair during the past year, and for his valedictory address. (Applause.)

The vote of thanks was carried by acclamation.

Mr. LEWIN PAYNE thanked those present very much for their kind vote. The meeting then terminated.

List of Members, May 1st, 1922.

ORDINARY AND CORRESPONDING MEMBERS.

Achner, Conrad A., 47b, Welbeck Street, W.1.
Aldred, Alex. B., 359, Brixton Road, S.W.
Allen, Arthur G., 128, Queen's Road, Bayswater, W.
Aubrey, H. P., 83, Portland Place, W.1.

Badcock, G. W., 32, Brunswick Place, Hove.
Badcock, J. H., 140, Harley Street, W.
Bailey, E. R., 40, Trinity Road, Wandsworth, S.W.18.
Baldwin, Sir H., 37, Cavendish Square, W.1.
Barrett, Russell, 41, Harley Street, W.1.
Bascombe, E. D., Melford Lodge, Bourne Avenue, The Square, Bournemouth.
Bennett, F. J., 23, Grosvenor Street, W.1.
Bennett, Norman G., 50, Brook Street, W.1.
Blaaberg, C. J., 29, Queen Anne Street, W.1.
Bowes, J. A., 28, South Side, Clapham Common, S.W.
Briault, E. H. L., 145, Finchley Road, N.W.
Bryan, Hermann, 26, St. Gile's Street, Norwich.
Bryant, E. H., Chelwood, St. John's Road, Tunbridge Wells.
Bull, F. B., 58, Wimpole Street, W.1.
Butchart, Jas. S., 2, Trinity Place, Windsor.
Buxton, J. L. Dudley, 38, Harley Street, W.1.
Byron, J. L., 213, North End Road, Kensington, W.14.

Calder, Edward, King Edward St., Potchefstroom, Transvaal (Corresponding Member).
Campion, G. G., 264, Oxford Road, Manchester.
Campkin, Hugh T., 71, Harley Street, W.1.
Chapman, Harold, 15, Upper Wimpole Street, W.1.
Charles, S. Wilson, Devonia, Rickmansworth, Herts.
Clarence, Thomas H., 24, Upper Wimpole St., W.1.
Clogg, Arthur H., Rockmount, 128 Church Road, Upper Norwood, S.E.19.
Coe, W. E., St. Norman's, Streatham Hill, S.W.
Colyer, Arthur R., 19, Upper Wimpole St., W.1.
Commander, Eric N., 11, Aldergate, Tamworth.
Crane, Walter A., Melford Lodge, Bourne Avenue, The Square, Bournemouth.
Cribb, H. E., 15, Stratford Place, W.
Croke, Augustin E., Sussex House, Guildford.

Denham, N., 29, Albemarle Road, Beckenham.
Doherty, J. W., 140, Harley Street, W.1.
Doubleday, F. N., 48, Welbeck Street, W.1.
Dowsett, E. B., 118, Gloucester Place, Portman Square, W.1.
Dreyfus, S., 16, Grand Pont, Lausanne, Switzerland. (Corresponding Member.)

Eady, Barrington, 29, Devonshire Place, W.1.
Edey, G. Russell, 153, High Street, Bromley.
Edgar, N., 39, London Road, Enfield.

Farmer, F. M. (Sir), St. Winifred's, Hampton, Middlesex.
Ferne, J. G., Holmleigh, Murray Road, Northwood, Middlesex.
Fisk, Sidney W., Street Lodge, Essex Rd., Watford.
Fox, Reginald A., 13, Wetherby Gardens, S.W.3.
Friel, Sheldon, 3, Fitzwilliam Place, Dublin.
Fry, W. Kelsey, Guy's Hospital, S.E.1.

Gardner, Stanley M., 24, Upper Wimpole St., W.1.
Garrow, A., 115, Harley Street, W.1.
Goldie, George J., 14, Upper Wimpole Street, W.1.
Grayson, J. Kenneth, Mount Pleasant, Turner's Hill, Cheshunt, Herts.
Green, W., South View, 10, North Common Road, Ealing, W.

Hammell, D. H., 19, Upper Wimpole Street, W.1.
Harborow, G. J., 38, Woburn Square, W.C.1.
Henry, C. J., 78-79, King William Street, E.C.4.
Henry, P. F., 79, King William Street, E.C.4.
Highton, Herbert C., 17, Harley Street, W.1.
Hopson, Montagu F., 7, Harley Street, W.1.
Housden, C. H., Thurnby, Jenner Road, Guildford

Iago, Miss P., 1, Devonshire House, High Road, Brondesbury, N.W.2.

James, W. W., 2, Park Crescent, Portland Pl., W.1.
Jameson, Alfred, 18, Jesmond Road, Newcastle-on-Tyne.
Jameson, J. T., 12, Windsor Crescent, Newcastle-on-Tyne.
Jennings, E. A., 4, Queen's Walk, Ealing, W.5.
Johnson, Arthur W., 71, Grosvenor Street, W.1.
Johnson, Gordon, 46, Lee Terrace, Blackheath, S.E.
Johnson, W. Trevor, 42, Sheep Street, Stratford-on-Avon.
Jones, Wm., 2, Colosseum Terrace, N.W.
Jones, H. Llewelyn, 9, Harley Street, W.1.

Knaggs, S. A., 21, Rosslyn Hill, Hampstead, N.W.
Knowles, C. Heygate, 15, Worsley Road, Hampstead, N.W.

Lacey, A. G., 9, Harley Street.
Lake, Carol P., 22, Sauthernhay West, Exeter.
Lawrence, F., 35, Brompton Road, S.W.3.
Levin, H., 63, Wimpole Street, W.1.
Leyton, G., 12, rue Belliard, Bruxelles. (Corresponding Member).
Lees, C., Breifond, Boyne Road, Tunbridge Wells.
Lindsay, Mrs. L., 23, Russell Square, W.C.1.
Lindsay, Robert, 23, Russell Square, W.C.1.
Lockett, A. C., Hereford House, 117, Park St., W.1.

McBride, John, 26, Duke's Avenue, Muswell Hill, N.
McKeag, H. T. A., 33, College Gardens, Belfast.
McKechnie, J. D., 29, Queen Anne Street, W.1.
McMahon, G. E., Connaught House, Beckenham, Kent.
Malleson, H. C., 30, Thurlow Rd., Hampstead, N.W.
Marsh, H. E., 1, Cantelupe Road, Bexhill, Sussex.
Marston, Allan T., 74, South Side, Clapham Common, S.W.4.
Mason, E. N., Sandown, 306, Broadway, Bexley Heath.
Matthews, G. F. Cale, 60, Newhall St., Birmingham.
Matthews, Trevor, 42, Sheep Street, Stratford-on-Avon.
May, W. J., 24, Upper Wimpole Street, W.1.
Mayer, J. W., Stedham House, Surbiton Hill.
Mellersh, W. Francis, 9, Harley Street, W.1.
Mendleson, B., 53, Queen Anne Street, W.1.
Messenger, H. L., 47, Rosslyn Hill, N.W.3.
Morris, C. S., 88, Park Street, W.1.
Morris, L. F., West Moor, Poole Road, Bourne mouth.

Newton, Sydney B., Brooklands, Uxbridge Road, Acton Hill, W.3.
Northcroft, George, 115, Harley Street, W.1.

Olver, S. Holloway, 42, Devonshire Street, W.1.
Ovey, William, 42, Gloucester Gardens, W.2.

Packham, A. L., 2, Park Crescent, Portland Place, W.1.
Parfitt, J. B., 179, King's Road, Reading.
Parker, Geo., 125, Elms Road, Clapham Common, S.W.4.
Pavitt, P. G., 57A, Wimpole Street, W.1.
Payne, J. L., 18, Portland Place, W.1.
Payne, A. L. Spencer, Beechcroft, Colney Hatch Lane, Muswell Hill, N.10.
Pearce, F. J., 57A, Wimpole Street, W.1.
Phillips, Edward, 1, Frognal, N.W.3.
Philpotts, Montague, 14, High Street, Windsor.
Pitt, Edward, Brandhoek, Gerrard's Cross, Bucks.
Pitts, A. T., 22, Wimpole Street, W.1.
Pollitt, G. Paton, 50, Brook Street, Hanover Square, W.1.
Pritchard, Geo. B., 18, Portland Place, W.1.

Rilot, Chas. F., 22, Wimpole Street, W.1.
Roe, Samuel H., 60, Newhall Street, Birmingham.
Rowlett, A. E., 165, London Road, Leicester.
Rushton, W., 32, Harley Street, W.1.

Salt, H. O., 21, St. Thomas' Street, London Bridge, S.E.1.
Samuel, Bertram B., 76, Wimpole Street, W.1

LIST OF MEMBERS, MAY 1st, 1922—continued.

Schelling, C., 37, Cavendish Square, W.1.
 Scott, P., 42, Devonshire St., Portland Place, W.1.
 Shore, H. D., 4, Seymour Street, W.1.
 Skipper, T. G., 52, Welbeck Street, W.1.
 Spiller, J. E., 62, Worple Road, Wimbledon.
 Spokes, P. Sidney, Castle Place, High Street,
 Lewes.
 Steadman, Sydney Francis St. Jermain, 9, Welbeck
 Street, W.1.
 Stephens, B. Maxwell, 76, Grosvenor Street, W.1.
 Sturridge, Ernest, 29A, Wimpole Street, W.1.
 Tebbutt, E. Spencer, 30, Finsbury Square, E.C.2
 Thew, W., 140, Harley Street, W.1.
 Thomson, George, 38, Harley Street, W.1.
 Toit, J. J. du, 11, Leevenovet Rd., Tambvers-
 kloof, Cape Town.

Torrance, T. A., 29, Queen Anne Street, Cavendish
 Square, W.1.
 Visick, Hedley, The Wolds, College Road, East-
 bourne.

Wallace, Dr. J. Sim, 150, Harley Street, W.1.
 Watkin, Harold G., 95, Durning Road, Liverpool.
 Webb, W. T. Clarkson, 41, Wimpole Street, W.1.
 Whittington, W. W., The Firs, Elm Road, Sidcup.
 Wilson, A. G., 9, Sandyford Place, Glasgow, W.
 Winderling, Prof. Aldo Maggioni, Via Manzoni 45,
 Milan, Italy. (Corresponding Member).
 Wood, Bryan J., 7, London Road, Kettering.
 Wright, J. Snarey, 55, Nottingham Place, W.1.
 Wright, Leslie D., 1, Wellfield Avenue, Muswell
 Hill, W.10.

HONORARY MEMBER.

Keith, Prof. Str A., Royal College of Surgeons, W.C.1.

*The Botolph Printing Works,
8, Gate Street, Kingsway, W.C.2.*

